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The AUTOMOBILE

Indiana-Pacific Reaches Kansas

Prosperous Conditions Along the Route Give Rise to Optimistic Predictions for Coming Season—Hospitality All Along the Line

Special to THE AUTOMOBILE

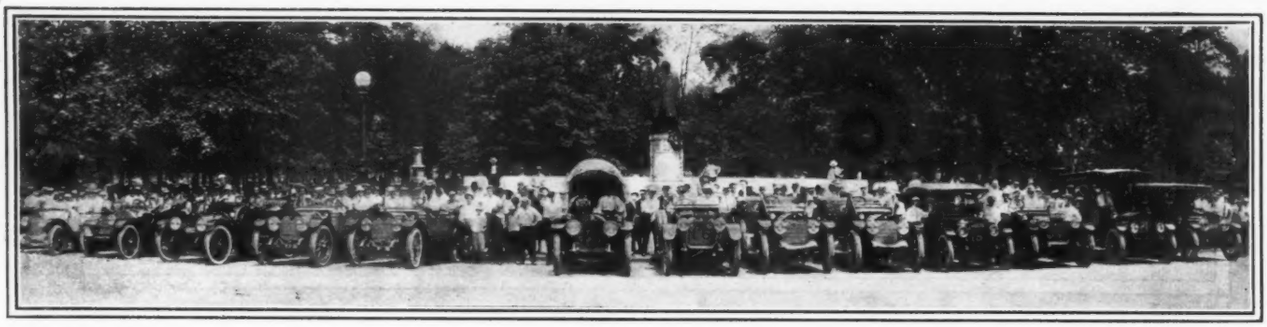
ELLIS, KAN., July 8—*Special Telegram*—The outlook for a prosperous year for the automobile in Kansas territory along the route of the Indiana-Pacific tour is very good. The wheat is now being threshed and while the crop is not the best a good yield is being obtained. The oats crop is very heavy and the corn looks good, although rain is needed now. Fewer garages and automobile dealers are being encountered along the route as the tour wends westward. Three points of particular interest were noted during the day. First, at Salina the Indiana tourists on the Golden Belt route crossed the Meridian trail from Minneapolis to Galveston. Later in the day near Kanopolis they were midway between the two coasts. At Russel Messrs. Bookwalter, Fisher, White and Westgard were invited by the county commissioners to meet with them to discuss the subject of their county roads.

KANSAS CITY, Mo., July 6—The Indiana Automobile Manufacturers' Association for two days has been "Showing Missouri" on its tour from Indianapolis to the Pacific Coast. Incidentally those of the Hoosier caravan who have participated in scores of automobile touring events in the past few years have concluded that Missouri offers wonderful possibilities from a scenic standpoint for automobile travel.

The exhibition of enthusiasm, the treatment of the roads, the marking of the route, and the general hospitality have not only equaled the very greatest demonstrations given in previous years, but also to a large extent have exceeded those of the past. Indeed, the tour in the "Show Me" state has brought out points which make the two days' trip across it a decided feature and one which the Indiana manufacturers will long remember.

The Hoosier party, consisting of twenty cars and about 75 men, has been en route four and one-half running days on their

Top—The arrival at Brazil, Ind., where ex-Mayor Bookwalter addressed the tourists Center—Pilot No. 20, driven by Russel Gaar, on a beautiful stretch near Springfield, O. Bottom—Shows the reception given to the Indiana tourists at Hume, Ill.



Line-up of the cars entered for the Indiana-Pacific tour

Two Hendersons passing through Paris, Ill., on second day
Taking on liquid refreshment from the "Firestone Water Boy"
Ex-Mayor Bookwalter speaking to the crowd at Hume, Ill.
Procession of the tourists' cars on way through Paris, Ill.

way toward the sunset from the Indiana capital. They have covered 676 miles, one-sixth of their journey, and have spent a day of rest in this city. Tomorrow morning they leave on their second stage, the run across the Sunflower State to Colorado. Every one of the participating cars rolled into this city yesterday afternoon in the parade, a convincing demonstration of their dependability.

Essentially the tour is a business proposition for the manufacturers who have entered it, consisting of a display of their product in actual service, the widening of trade acquaintanceship and the stimulation of interest among dealers as well as users. Many weeks ago the entrants made their plans for arousing the enthusiasm of their individual representatives and latterly the Hoosier Motor Club organ was sent out to extensive lists along the route. This, together with newspaper reports, has caused the Indiana dealers to be on the lookout for the tour and to line up their prospective purchasers for the opportunity to see the caravan. It is evident that the interest in this kind of a proposition is enormous among the sales representatives because in many instances they have gotten together to entertain the visitors where they had never previously been able to work upon a common basis. All of this has tended to increase prospects.

Consequently the trade conditions through this territory have appeared to be better than ever; this applies to both the agricultural and urban communities. As in the case of the Glidden tours of old the farmers have stopped their work and have driven miles to the route in order to witness the passing of the cars.

From the time that the Indiana delegation left its home city the receptions and entertainments en route have been numerous and hearty. Every evening and two or three times during each day the motorists have been stopped for pleasing diversions and for talks on the subject of road improvements. Indianapolis, Brazil and Terre Haute were hosts in the Hoosier commonwealth; Decatur, Springfield, Carlinville, Alton and Granite City had made special arrangements in Illinois; St. Louis, Columbia, Booneville and Kansas City did the honors in Missouri. Of special importance was the evening in St. Louis. This staid old city has always had difficulty in organizing anything among its dealers, but, headed by Robert E. Lee, the Indiana representatives, assisted by those of cars made elsewhere, entertained royally at the Sunset Inn. This beautiful place, located on the hills twenty miles from the city proper, was the scene of much gayety on Thursday evening.

Mayor Keil of St. Louis and ex-Mayor Bookwalter of Indianapolis were at their best and the former presented an American flag in behalf of Governor Major to Tour Chairman W. McK. White of the Marion Motor Car Co. At Springfield on the previous day Governor Dunne presented an American flag to Pilot Ray McNamara of the Premier company. On the same evening the Springfield dealers took the automobilists on special trolley cars to the Country Club at Columbia, Mo. The Columbia Club had an open house.

On the banks of the Missouri river is the little town of Booneville named after the famous pioneer and trapper Daniel Boone. At this point the "Big Muddy" now flows over Old Franklin, the

first white settlement made west of the Mississippi in Missouri. Because of its historical interest and the efforts of its good citizens to obtain improved roads, they took great pleasure in the visit of the Indiana automobile manufacturers and provided free ferriage, light luncheon, and refreshments, and then sent their touring guests westward.

Kansas City has entertained motor tourists before and knew that a tired group of men expecting a rest would wish to be at liberty for a little while. Twenty-eight miles out of the city they were met by Bruening Brothers, local Apperson dealers, and given light refreshments. Twenty-three Apperson cars and a dozen other machines formed the largest single delegation seen thus far. Sunday was open but at 6:30 Sunday evening the Kansas City people came to the hotel, took the Hoosiers for a long ride over the city's impressive boulevards and to Electric Park for the evening. This was a program much appreciated.

The presence of Carl Fisher in his Marmon has vastly increased the importance of the tour to road builders. They have hailed it far and wide and a large amount of actual road work was done. For example 100 miles of the St. Louis-Kansas City route was dragged and scraped, new culverts put in shape, and everything done to better the roads with the material at hand. From Indianapolis to Terre Haute the party followed the white bands of the Hoosier Motor Club on the poles; black and white banded poles appear along the Alton way from Springfield through Alton to St. Louis; and the red, white and blue bands of the Old Trails Association guided them across Missouri. The next 490 miles of the Golden Belt route, with the exception of the section from here to Topeka, have been specially worked.

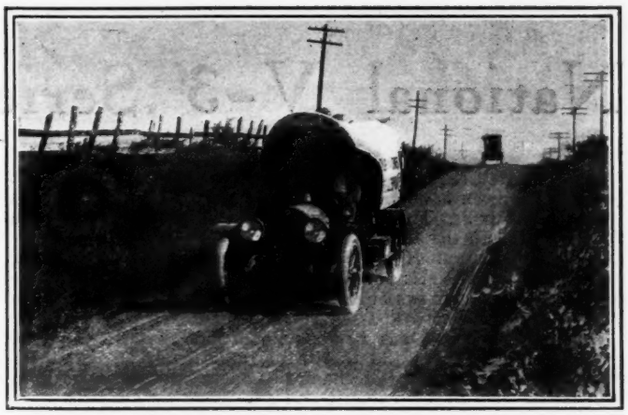
The tour is being run upon the lines which proved so successful in the two previous annual tours of the Indiana Automobile Manufacturers' Association. There are no rules, but certain regulations laid down by the tour committee are being definitely followed.

They draw lots each night for the daily running order; no one ever passes the pacemaker; on the outskirts of important towns where stops are made the individual cars wait long enough to get the whole party together for the parade into town. Leaving tomorrow morning the running order for the different teams is as follows: Apperson, Marmon, Premier, Marion, Haynes, American Pilot "Sixty," Pathfinder, Empire, and McFarlan. Ray McNamara, driving the Premier pilot car, precedes the tour by 2 hours each day.

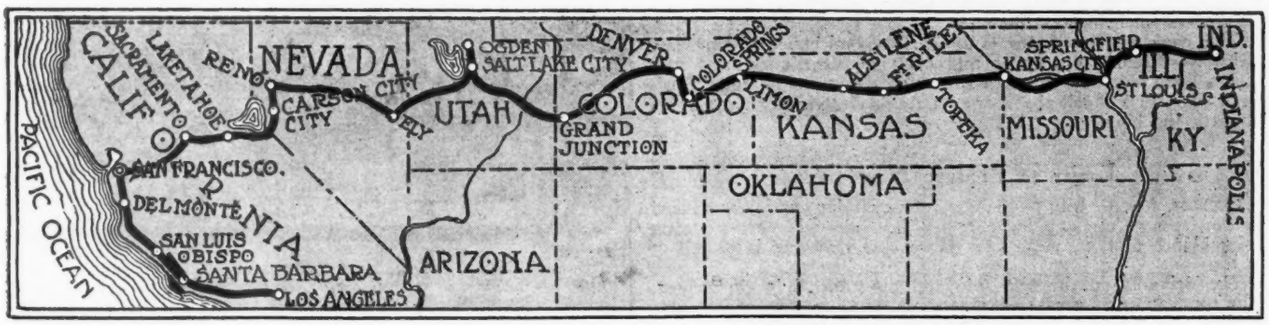
ST. LOUIS, MO., July 3—The only automobile tour that ever started east of the Mississippi river for the Pacific Coast reached St. Louis this afternoon when the Indiana Automobile Manufacturers' Association Indianapolis to Los Angeles tour, numbering twenty cars, arrived from Springfield, Ill.

DETROIT, MICH., July 3—Articles of incorporation have been issued by the secretary of state of Michigan to The Lincoln Highway Association, officers and directors have been elected, and a permanent organization effected.

With this legal formality disposed of it is believed that the thoroughfare from coast to coast will now go forward with a rush and great sections will be completed before the opening of the Panama Pacific exposition in San Francisco in 1915.



Premier truck 5 miles from Springfield on third day
No. 3 Henderson driven by Ray Harroun at the start
Tire inflation from storage tank on Brown truck
No. 17 Apperson fully equipped. Note tank in front



Map of the route followed by the tourists in the Indiana-Pacific tour

National V-3 Series Has Five Models

INDIANAPOLIS, IND., July 7—A new series, known as Series V-3, has been announced by the National Motor Vehicle Co. of Indianapolis. This company does not build yearly models but manufactures on the series basis. The new series V-3 is a continuation in general of the former series of the National cars, comprising five models; seven-passenger touring car, five-passenger touring car, four-passenger toy tonneau, two-passenger speedway roadster and a two-passenger semi-roadster.

This new series V-3 has a four-cylinder motor 4⅞ by 6 inches, cylinders cast in pairs and thoroughly annealed. The motor is mounted on the frame. Mechanically operated valves are used with nickel-steel heads, exhaust and admission on opposite sides and interchangeable. Spirally cut timing gears operating camshafts.

Two separate sets of spark plugs are used. Tapered nipples are used on intake, exhaust and water pipes in place of packings. The crankshaft is of vanadium steel ground to one-thousandth part of an inch, with extra long bearings. The aluminum crankcase is horizontally divided. Valve stems and springs are completely inclosed, eliminating noise and affording protection.

The tire pump is an integral part of the motor and will inflate a tire in 3 minutes. Self-contained aluminum cone, leather faced clutch, spring cushioned, giving gradual engagement. The clutch is removable without disturbing the transmission and operates smoothly. An efficient clutch brake is fitted.

The transmission is of the sliding-gear selective type, having three speeds forward and one reverse. The gears, made of chrome nickel steel oil tempered, run in an oil bath.

The wheelbase of the speedway roadster is 120 inches and that of the touring cars 128 inches.

These cars have wide continuous inclosed metal guards front and rear. Metal dust shield between frame and running board concealing tool box. A constant level force-feed oiler, with gear driven pump, feeds oil to the cylinders and bearings. The capacity is 4 gallons. The roadster has an auxiliary oil tank on rear deck containing 10 gallons with pressure feed to crankcase.

Ignition of this new series V-3 is by a gear-driven high-tension dual double distributor Bosch magneto with storage battery. Two sets of spark-plugs are located in valve caps in cylinder heads.,

The gasoline feed is by air pressure on all tanks generated by small pump in crankcase. A Rayfield carbureter, 1.75 inches, is used on all types except the roadster; or the Schebler is optional. It is placed on intake side of the motor and is heated by a hot water device. The throttle is operated by a lever on the steering column. Four effective brakes are fitted, two internal expanding hub brakes operated by foot pedal and two external brakes on rear wheel drums operated by lever.

The frame is pressed, wide flanged, 5-inch channel section on all models except the roadster, which is 4.5 inches; firmly riveted and braced and curved up over rear axle to allow low suspension of body and center of gravity.

The front axle is an I-beam one-piece steel forging. Large adjustable roller bearings are provided at the hubs and also at the top of the yokes. The drive consists of bevel gear through straight-line shaft, with double universals and torsion member. The rear axle is of the full floating type, the wheels turning on a double row of Timken bearings on a hollow axle, which carries all the weight.

The sheet metal bodies in this new series V-3 are extra roomy and low, with wide doors and side entrance at both sides, front and rear. The steering column is situated on the left side and the gearshifting lever is at the driver's right in the center. A centrifugal pump is used for the water circulation, the capacity of the system being 6 gallons.

The equipment includes Gray & Davis electric starting and lighting systems, top, cover and curtains, ventilating and rain vision wind shield; one extra Firestone demountable rim; Truffault-Hartford shock-absorbers on rear; electric horn concealed beneath the hood.

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Lozier to Produce New Four

DETROIT, MICH., July 7—A new four-cylinder car is announced by the Lozier Company for 1914. This model will bear a strong resemblance to the stream-line six of last year and is to sell at $2,100.

The drive is on the left side and the control in the center. The tonneau is of the seven-passenger type, the two extra seats folding into the back of the front seats when not needed.

The four-cylinder motor has dimensions of 4 inches bore by 6.5 inches stroke and is of the L-head construction. It will be noticed that the stroke is unusually long. Silent chain drive is used for the cam and pump shafts. Another silent chain drives the electric starter and lighting generator from the clutch shaft. The clutch is of the multiple-disk type, housed in the engine flywheel, and runs in a bath of oil. The transmission has three speeds forward and one reverse.

Engine lubrication is by the same system as used on the sixes—force feed to main bearings and splash for connecting rods and pistons. The crankshaft is 2 inches diameter at the connecting rod bearings and 3 inches length of surface.

Cooling is by means of a circulating pump system with an 18-inch fan and honeycomb radiator. For ignition a Bosch magneto of the dual single spark type is used. The front axle is an I-beam drop forging with nickel steel steering knuckles.

The wheelbase of the new four is 120 inches with wheels 36 inches in diameter. The tires are 4.5 inches all around and spare tires are carried in the rear. Included in the equipment will be the Gray & Davis electric starting and lighting system, top, built-in windshield, extra rim and tire carriers.

Delivery of the new four will not be made until January 1, 1914. For the coming year the Lozier Company will confine its efforts to the manufacture of two models, the other besides the one described being their light six, which sells at $3,250.

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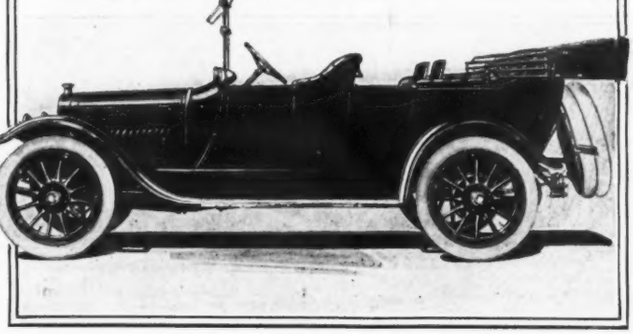
Pathfinder Adds a Six for 1914

INDIANAPOLIS, IND., July 7—A six-cylinder car is to be the feature of the Pathfinder line for the new season, the Motor Car Mfg. Co. joining the sextuple ranks with a small six to sell at $2,720. The motor is a Continental, 3.75 inches in bore and 5.25 inches stroke. At present arrangements are made only for its production as a six-passenger touring car, but it is probable that other bodies will be fitted later in the season. Tires are 35 by 5 inches in size. It is expected to make deliveries on the new six in August. One of the features of the new Pathfinders is a V-type radiator.

The single four-cylinder chassis model which was the sole design for 1913 is continued without radical change. The same size of motor is used as last year. This is 4⅛ by 5¼ inches in cylinder dimensions, and the only change in the motor is the lightening of pistons and connecting-rods of the new Continental, which it is said results in an increase of about 20 per cent. in the power capacity of the engine.

The motor is an L-head block casting. The chief feature of the motor design is the double lubricating system, which maintains uniform oiling on grades. This is accomplished by having two plunger oil pumps located in the lower half of the aluminum crankcase. One of them sends a stream of oil directly over the gears, from which the oil passes over the main front bearings and drains back into the front oil well. The rear pump feeds the oil back over the main rear bearings, from which it drains to the rear oil well. The oil troughs are intercommunicating. Both pumps work on eccentrics instead of cams, making them noiseless.

In the general arrangement of the four-cylinder chassis there is embodied the unit power plant with the cone clutch in the engine flywheel. The clutch has spring inserts to prevent grabbing and ball release bearings instead of roller bearings to reduce



New four-cylinder, long-stroke Lozier touring car for 1914

Verbeck in Fiat Wins Panama-Pacific

the noise. The gearset is of the three-speed selective type of Brown-Lipe manufacture. The gears are vanadium chrome steel on Rhineland bearings. The gearshifting system is of the sliding-tub type. The propeller shaft is inclosed in a torsion tube which is fastened at its front end to a yoke on the center cross member to take up torsional strains. Side strain in the propeller shaft housing and yoke is removed by the use of a 7-inch slip collar with a bronze bushing.

A floating type of rear axle is employed and the maker lays stress upon the useful feature of the small hole in the axle through which the mesh of the pinion and gears may be felt so that need of adjustment may be ascertained. The conventional right steer and right control are retained.

One of the earmarks of Pathfinder cars is the design of the wheel which, by the shape of the felloe, is given a colonial effect. The maker calls it the chariot wheel.

Frame members are particularly deep and are of the double drop type with a very heavy cross member in the center which carries the shifting lever and torsion tube yoke. The body is set on the lower part of the frame, so that the axles have a gravity center below even what it appears to be.

Body styles fitted to the four-passenger chassis include the Martha Washington coach, a three- or four-passenger coupé, the cruiser, which is a particularly racy type of body with a very long rear deck, and an armored roadster which is being featured as a physician's turnout. A new body is a five-passenger streamline touring, which takes the place of the four-passenger touring of the 1913 line.

The chief changes in body detail are alteration in lines to produce the streamline effect and the more sweeping curves in the forward fender, which also has been made perfectly smooth on top, without the conventional side ridge. A new feature of the Pathfinder cruiser is the optional location of the taillight. The taillight may be carried in the conventional way or, if desired, may be carried in the pointed end of the rear of the car.

Lighting and engine cranking are provided for by a special Gray & Davis system comprising an engine-driven generator, storage battery, and starting motor.

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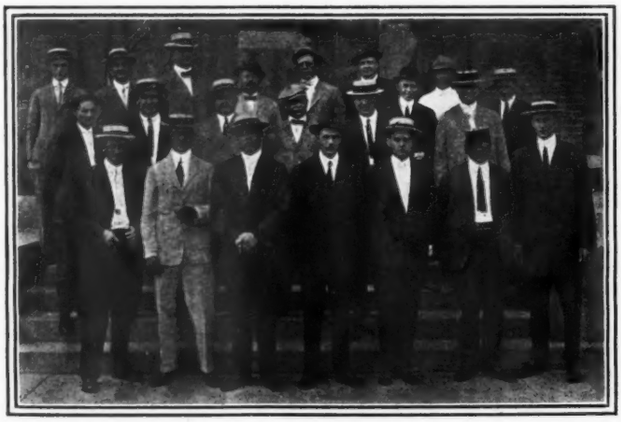
Knox Makes Few Changes for 1914

SPRINGFIELD, MASS., July 7—Changes in Knox cars for 1914 will include only the addition to the body types already shown in 1913 of the Prince Henry, or streamline, type of body, in four-five, six and seven-passenger sizes on the Knox Little Six chassis. Electric starting and lighting are applied to all 1914 passenger cars.

In the commercial car field the Knox company is dropping the 5, 6 and 7-ton trucks and increasing its production of Knox-Martin tractors, which are proving a more economical means of heavy hauling.

In fire apparatus the company is continuing along its previous lines but laying special emphasis on its hose and chemical cars.



Lozier salesmen at convention, from left to right: Top—C. V. McGuire, J. G. Perrin, N. R. Feltes, J. M. Gilbert, Paul Smith, B. W. Collins, E. O. Pollard. Center: H. W. Miller, F. H. Smith, H. C. Whitney, F. B. Willis, J. B. Hulett, A. M. Potter, A. E. Laffrey. Bottom: W. J. Drumpelmann, W. D. Allen, H. A. Shomo, J. C. Wheeler, G. F. Batchelder, F. W. Thomas, H. A. Wehmeir.

Cars and Drivers That Reached Finish. Prize Money Will Be Divided Among Ten.

Finish	Car and No.	Driver	Time
1	Fiat, No. 9	Verbeck	11:01:16
2	Buick, No. 45	Ed. Waterman	11:21:25
3	Fiat, No. 7	Barney Oldfield	11:22:53
4	Cadillac, No. 1	C. Soules	11:26:16
5	Alco, No. 30	W. H. Carlson, Jr	11:28:03
6	Pope-Hartford, No. 48	J. Fleming	11:28:20
7	National, No. 34	Barcroft	11:35:52
8	Simplex, No. 5	Toft	11:39:32
9	Apperson, No. 33	Hanshue	11:56:30
10	Cadillac, No. 8	Beaudel	11:57:31
11	Simplex	Faulkner	12:03:50
12	National, No. 21	Briscoe	12:03:55
13	Ford, No. 43	Schnack	12:27:44
14	Overland, No. 14	McKelvey	12:44:12
15	Stutz, No. 40	Siefert	12:46:53
16	Buick, No. 18	Nikrent	12:47:34
17	Mercer, No. 10	Morris	13:14:48
18	Kissel, No. 20	Kern	13:16:56

The winner will at once receive about $6,500. Verbeck, it is stated, will be protested for alleged failure to stop in control at Fresno. Distance of race, 443.6 miles.

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SAN FRANCISCO, July 6—The Panama-Pacific road race has come and gone, and is unanimously declared the most remarkable road race ever held. Fifty cars left the starting line in Los Angeles. The first, a Fiat, reached Sacramento, the state capital, 443.6 miles distant, through mountains and valleys, in 11 hours 1 minute 16 seconds. The next 28 minutes witnessed the arrival of no less than five more of the contestants, notwithstanding the great distance and many trying conditions. Within 2 hours and 15 minutes eighteen cars had passed the checkered flag at the state fair grounds at Sacramento, and before the race was called off several additional machines checked in.

Old-timers like Barney Oldfield, who took third in a Fiat; Jack Fleming, Vanderbilt Cup veteran, who took sixth with a Pope-Hartford; Harris Hanshue, veteran "Grand Circuit" driver, who took ninth with an Apperson; Frank Verbeck, holder of world's 24-hour motordrome record, whose Fiat on Friday won the Panama-Pacific; Louis Nikrent, holder of many coast records, and Teddy Deaudet, who 2 years ago cleaned up about every record in California—all these men declare that the Panama-Pacific road race is the greatest contest in which they have ever participated.

The race itself was a tremendous success. Long before midnight, Friday morning, July 4—the hour for starting—tremendous crowds assembled at the starter's post in Los Angeles.

After a journey of about a mile and a half through the city and streets, during which the cars were kept within the speed limit prescribed by the Los Angeles fathers, the racers entered upon the 30 miles of San Fernando boulevard, where the drivers threw their throttles wide open.

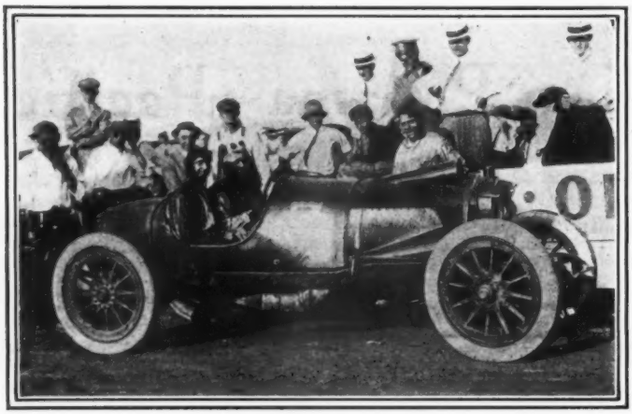
At Bakersfield, the first important checking station, another large crowd awaited the arrival of the racers. They were rewarded at 4:24, when the distant roar of a flying machine could be heard. A moment later Cadillac No. 1 dashed into view and came to a halt at the control station. Seven minutes later Verbeck, in a Fiat, flew alongside, having passed eight of those who started before him in the first of the arduous journey. Close at his heels, only 2 minutes away, the veteran racer, Barney Oldfield, came pounding along at the wheel of his 120-horsepower Fiat.

Beaudet, driving Cadillac No. 8, swung into town 3 minutes later, 1 minute ahead of Omar Toft, in Simplex No. 5.

Soules roared into Fresno at 7:12, still holding a 9-minute lead over Verbeck. Both drivers had gained little on those following since leaving Porterville, but relative positions among the first five remained the same. Two hundred and seventy-eight miles had now been negotiated, and all of the cars seemed to be running as "sweetly" as sewing machines when passing through Fresno.

Leaving Fresno for the 55-mile run to Merced, Verbeck made a sensational spurt, which eventually won him the race. Starting 9 minutes behind Soules, he pulled into the checking station at Merced full 5 minutes ahead of the plucky Cadillac driver. From that time to the finish at the fair grounds he was never headed.

Oldfield clung tenaciously to third position, passing through Fresno at 8:55. Omar Toft, in Simplex No. 5, had also made a substantial gain and pulled up 8 minutes ahead of Beaudet, in Cadillac No. 8.



Ralph Mulford in the Mason special with which he won the 200-mile race at Columbus

At Stockton, 396 miles upon the way, Verbeck had increased his lead to 13 minutes and was confident of victory, barring accidents or breakdowns. Soules, Oldfield, Toft and Beaudet followed determinedly in his dusty wake, making a final dash for the coveted finish line 47 miles away.

At 15 minutes past 11 a bugle call announced "Car in sight," and 3 minutes and 16 seconds later Fiat, with Verbeck at the wheel and H. Ham as mechanician, swirled on to the track in a cloud of dust, circled the track at a breakneck speed and pulled up before the judge's stand, a winner.

Just 8 minutes later Charley Soules, in Cadillac No. 1, flashed under the wire, to be greeted with another noisy congratulation.

Barney Oldfield at the helm of Fiat No. 7 was next to finish, and third prize was annexed by the veteran in handy style. His elasped time was 11:22:53. Barney remained at the wheel throughout the entire struggle, and had he not proceeded 5 miles on the wrong road out of Fresno, he might have finished at the head of the list. Oldfield also had the misfortune to break a driving chain, which became jammed in a spring clip. To straighten out this tangle consumed 11 minutes.

The tenth car to come into view of the crowd was granted the most enthusiastic reception of any of the racers. It was Buick No. 45, driven by Ed Waterman, Jr. This car, although among the last to start, won second prize, having come from Los Angeles in the remarkable time of 11:21:25.

Overland Car Wins Santa Fe Race

ALBUQUERQUE, N. M., July 4—Pounding over the steepest mountain roads in New Mexico and covering a distance of 130 miles in 4 hours 19 minutes and 58 3-5 seconds, "Red" Sperry, at the wheel of an Overland roadster, this afternoon won the Albuquerque-Santa Fè road race, the first contest of the kind ever held in this state.

Of the nine starters that were sent away in the morning, only three finished within the time limit. Emblem, driving a Buick, was second, 1 hour and 14 minutes behind the victor. J. Cadwell, in a Velie, trailed almost a half hour astern Emblem for third money.

J. Hesch, the Buick driver, suffered the only accident of the race that might be termed serious. While descending La Bajada hill at a speed of 60 miles an hour, his car blew a tire and turned turtle, rolling down the mountain side to be crushed to pieces on the rocks below. Hesch was injured internally but his mechanician was only slightly bruised.

Mason Wins in Mason at Sioux City

SIOUX CITY, IA., July 4—*Special Telegram*—George Mason, driving a Mason special, scored a "native son" victory today on the Sioux City 2-mile dirt track, winning the 40-mile free-for-all, the feature event of the first day's motor racing card, and taking the 16-mile contest in addition.

Mason covered the twenty laps in the free-for-all in 32:36 and led from starting gun to checkered flag. He finished over 3 miles in front of Jack Newhouse, the driver of the Case Tornado, who won second money. Louis Disbrow, handicapped by tire trouble, was third in the Simplex Zip and showed spurts of 90 miles an hour in his pursuit of the leader.

While no track records were smashed, Joe Nikrent established a new mark by changing a wheel and tire in 16 seconds.

6-Mile

Car	Driver	Time
Mason	Chandler	5.27
Chalmers	Wetmore	...
Case	Bill Endicott	...
Pirate	Ulbricht	...

10-Mile

Car	Driver	Time
Case	Disbrow	8.40
Case	Nikrent	...
Pirate	Ulbricht	...
Chalmers	Wetmore	...

16-Mile

Car	Driver	Time
Mason	Mason	13.39 1-5
Case	Nikrent	...
Case	Disbrow	...
Moon	Shrunk	...

20-Mile

Car	Driver	Time
Mason	Snyder	18.47
Chalmers	Wetmore	...
Case	Newhouse	...

8-Mile

Car	Driver	Time
Case	Nikrent	7.19
Mason	Mason	...

40-Mile

Car	Driver	Time
Mason	Mason	32.36
Case	Newhouse	...
Simplex	Disbrow	...
Chalmers	Wetmore	...

Disbrow Breaks Record on Second Day

SIOUX CITY, July 5—*Special Telegram*—Louis Disbrow was the star of the second and final day's events in Sioux City's annual speed meet on the 2-mile dirt track this afternoon, the veteran of the Case team establishing a new world's record of 9:24 2-5 for 12 miles with the Simplex Zip and capturing the 48-mile sweepstakes feature at the wheel of the same car in 40:11.

6-Mile

Car	Driver	Time
Mason	Chandler	5.17⅘
Case	Endicott	...
Chalmers	Wetmore	...

10-Mile

Car	Driver	Time
Mason	Mason	8.34⅕
Case	Nikrent	...
Case	Bill Endicott	...
Case	Disbrow	...
Moon	Shrunk	...
Buick	Broker	...

8-Mile

Car	Driver	Time
Mason	Snyder	7.19⅗
Case	Newhouse	...
Chalmers	Wetmore	...

12-Mile

Car	Driver	Time
Mason	Mason	9.58⅕
Case	Bill Endicott	...
Case	Disbrow	...
Case	Nikrent	...
Mason	Chandler	...

12-Mile, Handicap

Simplex	Disbrow	9.24⅗
Case	Bill Endicott	...

48-Mile Sweepstakes

Simplex	Disbrow	40.11
Mason	Mason	...
Case	Bill Endicott	...
Case	Nikrent	...

Knight Killed—Mulford Wins at Columbus

COLUMBUS, O., July 4—The third annual 200-mile automobile race held at Columbus, O., July 4, under the auspices of the Columbus Automobile Club, was marred by a fatal accident in which Harry C. Knight, driver, and Milton Michaelis, mechanic, on the Rovan special, lost their lives. Knight was driving the new front-drive car manufactured by the Kinnear Mfg. Co. of Columbus when it skidded and blew the right rear tire. The car then turned turtle, throwing both driver and mechanic out. Knight was killed instantly, while Michaelis lingered at a local hospital for 4 hours without regaining consciousness.

The race was won by Ralph Mulford in a Mason special in the record time of 3 hours 21 minutes and 48 seconds, which is the record for a dirt track. The previous record was held by Spencer Wishart in a Mercer, who covered the distance in 1912 at Columbus in 3 hours 28 minutes and 4.50 seconds. Mulford had the race all his own way from the fiftieth lap and would have lowered the mark by 10 minutes more had he been pushed. As it was he was only out of the race on one occasion for a few seconds for oil. His Braender tires held up well and were in good condition at the close of the race.

Madden, driving a Nyberg, was second, having covered the distance in 3 hours 44 minutes and 26.65 seconds. The Nyberg was only out three times for tire changes and raced consistently.

Reeder, driving a Mercer raceabout was third in 3 hours 47 minutes and 53 seconds, while De Palma was fourth in 4 hours 4 minutes and 50.80 seconds.

SCORE OF CARS PARTICIPATING IN 200-MILE RACE AT COLUMBUS, O., JULY 4

Driver and Car:	Miles 10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200—Finish
Mulford (Mason Special)	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1 — 3:21:48
Madden (Nyberg)	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2 — 3:44:26.65
Reeder (Mercer)	7	6	5	3	3	3	4	4	4	4	3	3	3	3	3	3	3	3	3	3 — 3:47:53
De Palma (Mercer Special)	8	8	8	7	6	6	6	6	6	5	4	4	4	4	4	4	4	4	4	4 — 4:04:50.80
Jenkins (Schacht)	6	7	7	6	5	5	5	5	5	6	5	5	5	5	5	5	5	5	5	5 — 4:05:57
Knight (Rovan)	5	5	3	8	7	7	7	7	7	7	6	(Out, car overturned)								
Rickenbacher (Mason Special)	1	1	1	5	4	4	3	3	3	3	(Out, broken transmission)									
Fritsch (Senate Flyer)	3	3	6	4	(Out, broken cylinder)															

Cooper's Stutz Has Clean Sweep at Tacoma

TACOMA, WASH., July 5—In Tacoma's second Montamara race meet today Cooper won the 220-mile Potlatch trophy race, piloting his Stutz to victory after fifty-seven laps around the 3½-mile course in 2:49:32 at an average of 71:07 miles an hour. Burman in his Keeton won the second portion of the $3,500 purse, doing the distance in 3:10:28. Endicott in his Nyberg special was flagged off the track at the end of fifty-second lap but annexed a bonus of $150 for cars under 350 cubic inches finishing.

The twenty-sixth lap was disastrous. Tetzlaff went out with a broken camshaft and Burman lost one cylinder which probably cost him the race. Welsh in a Locomobile was forced out in the twenty-seventh lap by a broken camshaft, and Hughes in the forty-sixth lap on account of burned-out bearings. In the forty-sixth lap the Interstate crept into second place but lost time at the pits and was succeeded by Burman at the finish. Cooper was 6 minutes ahead, Burman one lap ahead of the Interstate, and Endicott five laps behind the Interstate.

In the inter-city race it was mostly Parsons and his Stutz. He was first away at the start, and held the place against eight speedy drivers until the final flag. Parsons made 102.167 miles in 1:33:53 4-5, the average for the entire distance being 65.17. E. J. Cameron of Victoria in a Stutz was second in 1:36:36 4-5 while Hanson in a Hudson special came in in 1:51:16 with third place. Leybold in a Buick took fourth place, his time being 2:12:59 3-5. The contest narrowed on account of a number of entries dropping out early in the race. The Apperson was out at the end of the first lap and again in the fourth on account of cylinder trouble. Ballard in the Thomas had engine trouble in the sixth lap and retired. The eight-cylinder Romana was out at the close of the fifth. The Buick driven by Leybold ran twenty-nine laps without a stop, being the only car to make a good record and winning the special prize. Staley, in a Studebaker, killed a dog in the twenty-fourth lap which forced the car out of the race.

Upwards of 20,000 enthusiastic spectators from all parts of the coast witnessed the contest. Cooper lowered Tetzlaff's records on the course for 1912. The weather was ideal for the first day's racing on account of the heavy rain.

Burman in a 200-horsepower Benz made a mile in 32 seconds in practice on the morning of July 4, being timed by F. M. Fretwell.

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TACOMA, WASH., July 7—*Special Telegram*—Roaring over the finishing line less than 2 minutes ahead of Dave Lewis, Earl Cooper of San Francisco, at the wheel of the sturdy Stutz, today won the 250-mile Montamarathon, the feature event and closing contest in Tacoma's second annual speed carnival.

In covering the 250 miles in 3 hours 32 minutes and 8 1-5 seconds, California's native son averaged 70.71 miles an hour and duplicated his victory of Saturday when he captured the 200-mile Potlatch trophy race. Cooper stopped but three times at his pit for tires and encountered no mechanical trouble.

Dave Lewis, driving the 70-horsepower Fiat, finished second and was a stubborn challenger all the way. Hughie Hughes was third in the Tulsa. Harry Endicott, with the diminutive Nyberg Special, was the only other finisher. He received a piece of the added prize money through having a car which had a piston displacement of less than 450 cubic inches.

Two other starters, Nichols, the Apperson pilot, and Hanson, the Hudson entrant, were running when the race was called.

Four of the ten cars that faced the starter when the bomb was fired were docked at the pits disabled.

Car	Driver	Time	M.P.H.
Stutz	Cooper	3:32:08⅕	70.71
Fiat 70	Lewis	3:35:00	69.76
Tulsa	Hughes	.....	.....
Nyberg	H. Endicott	.....	.....
Apperson	Nichols	Running when race was called	
Hudson	Hanson	Running when race was called	
Benz 120	Burman	Out on 49th lap, broken gas line	
Locomobile	Welch	Out on 15th lap, stripped gears	
Benz	Jeannette	Out on 15th lap, broken piston rod	
Fiat 120	Tetzlaff	Out on 14th lap, broken oil pump	

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Fast Time by Boillot and Goux

AMIENS, FRANCE, June 27— Official speed trials in view of the Grand Prix race to be held on the outskirts of this town on July 12 have been held this week. The basis of the race is a fuel allowance at the rate of 14.1 miles to the gallon. With such a restriction it is being asked if the cars can attain the same high speeds as the racers which took part in last year's contest at Dieppe, where absolute liberty was granted. So far as can be judged from these preliminary trials, this year's cars, although considerably smaller than those of a year ago, will be as fast, if not faster than the racers of 1912. The fastest time for one round of the course is 15.12, established by Boillot on Peugeot. As the course measures 19.64 miles, this is at the rate of 77.5 miles an hour. This time was made under rather unfavorable circumstances, for the course was very dusty and a considerable amount of fog prevailed. Goux, with the second Peugot, practically equalled Boillot's time on the second day of the trials. Guyot, on Delage, made 16.12 for one round of the course standing start; with a flying start his teammate Bablot made 16 flat. It is evident that there will be very keen competition between the two Peugeots and the two Delage cars. It is not certain that the Peugeots kept within the fuel allowance, but the Delage cars kept below the quantity of fuel allowed throughout their tests.

All four Sunbeams were on the course, but did not make very fast times. The fastest work in this team was done by Chassagne, who has been selected to replace Victor Rigal, in 16.25. On the second day all four cars went round in practically 17 minutes, thus showing remarkable regularity but being too slow to hope to successfully compete against the Peugeots and Delage unless they are keeping power in reserve. It is understood, however, that the six-cylinder Sunbeams made use of the whole of their gasoline to attain these times. Schneider, Itala, Excelsior, Opel and Mathis have not yet put in an appearance on the course, and as the roads are now closed for practice work, it looks as if they will have to start in the race without having been round to test their fuel consumption. Even among drivers who have taken full advantage of the days set apart for practicing there is a considerable amount of dissatisfaction at the small amount of time allowed for training on the course. Competition is likely to be so severe that no maker can afford to run with a certain amount of gasoline in reserve. The winning car will doubtless finish with not more than half a pint of gasoline in the tank. But in seeking to gain every possible ounce of power there is a possibility of overshooting the mark and being left stranded before the finish with an empty tank. To avoid this the drivers are all clamoring for permission to use the course for practicing. The power to grant this lies with the local authorities, who are so afraid of accidents that they hesitate to open the roads without the presence of troops. The Sunbeam people were so dissatisfied with the opportunities that have been given them for training that there has been some talk of withdrawing from the race.

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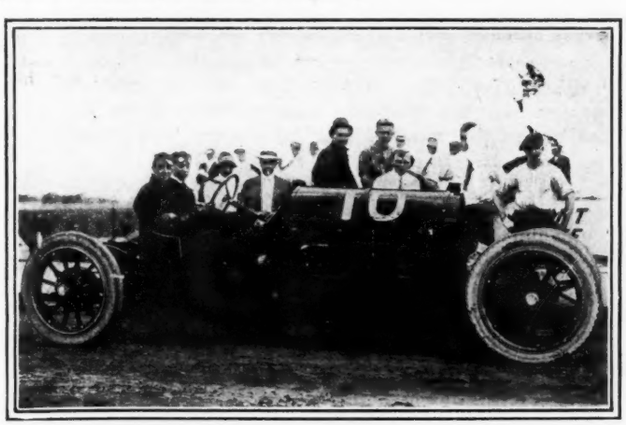
Motor Dealers' Races To Be Held August 9

NEW YORK CITY, July 7—At the request of several prominent racing drivers who are anxious to compete at the race meets to be held under the auspices of the Motor Dealers' Contest Assoc., a special meeting of the race committee of that organization was held recently and it was decided that the first meet take place on Saturday afternoon, August 9.



Harry Knight and his mechanician in the Rovan special in which they were killed at Columbus, O., July 4

Columbus Buggy Is Active

Plans To Turn Out Better Cars Than Ever Before—Wire Wheels To Be Optional

COLUMBUS, O., July 7—According to the plans of the Columbus Buggy Co. it will turn out better gasoline cars in the future than ever before. Facilities for handling a large business have been made. It is the intention to spend much time in putting a good medium priced car on the market that will be as well known as the buggies manufactured by this company for many years.

To show that the company intends to invade the field on a larger scale, thirteen gasoline cars were built and sold last week. These cars are the latest design. Buyers have an option on the wire or wood wheels. While much attention is being paid to the gasoline end of the field, electric carriages and buggies are not being overlooked.

Henderson To Sell $100,000 Stock

INDIANAPOLIS, IND., July 7—At a recent stockholders' meeting of the Henderson Motor Car Co., it was voted to sell the remaining unissued shares of common stock, amounting to $100,000. It is possible that all of the new issues will be taken by the present Henderson stockholders.

INDIANAPOLIS, IND., July 7—A new charter for 50 years has been issued to the Nordyke & Marmon Co. of Indianapolis by the state. The company has also increased its common stock $200,000 and has issued $500,000 worth of preferred stock.

CLEVELAND, O., July 7—*Special Telegram*—G. R. Wadsworth has resigned his position as engineering manager of the Peerless Motor Truck Co. to become affiliated with Gray & Davis of Boston, Mass. Mr. Wadsworth has had a wide experience and is well known to the leading engineering societies of this country and England.

Tax Law To Be Tested in Ohio

COLUMBUS, O., July 5—Steps for the test of the new Warnes' automobile horsepower tax law have been taken by President C. C. Janes, president of the Ohio State Automobile Association. To that end he has named three attorneys, C. D. Saviers of Columbus; Harry P. Gordon of Cincinnati and John A. Alburn of Cleveland to canvass the situation and recommend to the executive board of the organization.

It is proposed to bring a test suit to try to prove the unconstitutionality of the new law, which taxes automobiles on their horsepower. It is claimed by automobile people that the law is unconstitutional as it provides for double taxation.

MONTGOMERY, ALA., July 5—After a long legal fight the supreme court has upheld the constitutionality of the automobile tax law in this state. Motor car owners have spent several thousand dollars in pushing the case.

MADISON, WIS., July 5—Motor car and cycle owners of Wisconsin have, during the fiscal year ending June 20, 1913, contributed nearly $200,000 to the state in license fees, according to the report of A. J. Cobban, state motor registry clerk. The 30,000 mark in Wisconsin registration will be reached before July 1, as on June 20 the number stood at 29,550, which is 4,000 in excess of the number of licenses in force on December 31, 1912.

Summer Show for Cleveland

CLEVELAND, O., July 6—Cleveland's first midsummer automobile show will be the biggest ever held in the country, according to plans mapped out by Fred H. Galey, manager of the Cleveland Automobile Show Co. The two tents which have been obtained cover 3 acres of ground. The show will be given in connection with the Forest City fair at North Randall the last week in August.

BISMARCK, N. D., July 7—Automobile registration in this state has reached 12,000. It is believed every car in the state has been tagged. The secretary of state is advertising for bids for 1914 tags.

AKRON, O. July 7—The Goodyear Tire and Rubber Co. has brought out a new tire for electric vehicles called the Power Saver Pneumatic Tire. This tire is especially designed for the requirements of electrics.

NEW YORK CITY, July 8—The Enterprise Automobile Co. of this city has licensed under the Dyer patents two new companies, namely, the Brown Commercial Car Co., Peru, Ind., and the Crow Motor Car Co., Elkhart, Ind.

INDIANAPOLIS, IND., July 7—F. R. Bump has been made assistant to the president of the Marion Motor Car Co., of this city and not of the American Motors Co., as we stated in THE AUTOMOBILE last week.

New York 50-Foot Rule Upheld

NEW YORK CITY, July 5—A decision rendering it illegal for a garage to operate within 50 feet of a schoolhouse, theatre or moving picture establishment has just been upheld by the decision of Justice Goff in Supreme Court. The case was that of James McIntosh who had operated a garage in New York for the past decade and who had to ask for a renewal of his operating permit. On account of the 50-foot rule, the essence of which is given above, he was refused the permit. It is easy to see that this ordinance, which was framed early in 1912, is apt to drive any number of garages out of business, as all that is needed to achieve this end is for a competitor to open a small moving picture place close to the garage and the renewal of permit will be refused to the latter. The case will be appealed.

Automobile Securities Quotations

Rubber stocks are recovering from their downward plunge of a month ago and a general advance is noted all along the line in these issues. Firestone Tire & Rubber common advanced 20 points, Goodyear Tire & Rubber common advanced 13, U. S. Rubber common advanced 2. The only falling off in price noticeable is that of the Portage Rubber preferred which dropped 9 points under last week's quotation.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	115	..	150	165
Ajax-Grieb Rubber Co., pfd	95	100	94	99
Aluminum Castings, pfd	100	..	97	100
American Locomotive Co., com	42½	43	28½	29
American Locomotive Co., pfd	107¾	109	100	102
Chalmers Motor Company, com	..	..	135	..
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	15	18	14	18
Consolidated Rubber Tire Co., pfd	..	59	60	75
Firestone Tire & Rubber Co., com	276	278	285	300
Firestone Tire & Rubber Co., pfd	106	108	103	104
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	99	101	85	95
General Motors Company, com	31	33½	27	32
General Motors Company, pfd	74½	75	72	72½
B. F. Goodrich Company, com	77¼	78¼	27½	29
B. F. Goodrich Company, pfd	108¾	109	90	92½
Goodyear Tire & Rubber Co., com	302	304	335	345
Goodyear Tire & Rubber Co., pfd	102	104	98½	100
Hayes Manufacturing Company	..	96	..	90
International Motor Co., com	23	25	3	5
International Motor Co., pfd	82½	85	18	25
Lozier Motor Company, com	..	..	15	20
Lozier Motor Company, pfd	..	..	..	90
Maxwell Motor Co., com	..	..	3	3½
Maxwell Motor Co., 1st pfd	..	..	24	27
Maxwell Motor Co., 2nd pfd	..	..	7	8½
Miller Rubber Company	155	160	133	137
Packard Motor Company	105	107	98	102
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	30	32	5	10
Pope Manufacturing Company, pfd	73	74½	..	35
Portage Rubber Co., com	..	..	..	45
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	8¾	9¼	10	11¼
Reo Motor Car Company	19	20	19	21
Rubber Goods Mfg. Co., pfd	..	..	100	110
Studebaker Company, com	30	32	22½	25
Studebaker Company, pfd	91½	92½	82	86
Swinehart Tire Company	99	101	85	88
U. S. Rubber Co., com	..	..	60½	61½
U. S. Rubber Co., 1st pfd	..	..	104	104¾
White Company, preferred	107½	108½	102	104
Willys-Overland Co., com	..	..	56	60
Willys-Overland Co., pfd	..	..	85	90

Build Columbus Electric

Former Buggy Makers in Combine for New Product

COLUMBUS, O., July 7—The Columbus Electric Vehicle Co., incorporated with a capital of $50,000 to manufacture and deal in automobiles and trucks, will soon organize and locate a factory in Columbus. The prime movers of the new concern were formerly in the management of the Columbus Buggy Co. Charles E. Firestone was secretary and O. H. Perry treasurer of the defunct company. For the time being the concern will confine itself to the manufacture of electric passenger vehicles.

Partin and Palmer Motor Combine

DETROIT, MICH., July 7—The Partin Mfg. Co., Chicago, and the Palmer Motor Car Co., of this city, have been combined, and an office at 29 South La Salle street has been opened in Chicago, where all the product is to be disposed of.

The list of these is as follows:

The Crown, a four-cylinder, 21-horsepower cyclecar, listing at $385; the Partin-Palmer, 38-horsepower and fully equipped, listing at $975; the Partin 45 which, fully equipped, lists at $1,275.

Connecticut Law Changed

HARTFORD, CONN., July 5.—Governor Baldwin of this state has signed an amendment to the present automobile law, which demands two powerful brakes for all cars of more than 10 horsepower, mufflers for all motor cars, and signals which can produce an abrupt sound as a sign of danger and which must not be abused.

Truck Club Is After New Members

NEW YORK CITY, July 7—The Motor Truck Club has started a membership competition to stimulate the already rapid growth of the club. The contest began June 30 and ends August 23, a prize being awarded each week to the member ranking first for the week.

Quaker Truck Parade July 31

PHILADELPHIA, PA., July 5—The Philadelphia *Inquirer*, with the co-operation of the Philadelphia Automobile Trade Association will on Thursday, July 31, conduct the third annual commercial vehicle parade through the principal business thoroughfares of the city. This parade was inaugurated here by The Inquirer 2 years ago and instantly proved a success.

Prest-O-Lite Makes Fuel Economy Test

INDIANAPOLIS, IND., July 3—In a fuel economy test conducted yesterday at the Speedway by the Prest-O-Lite Co. under the observation of a representative of THE AUTOMOBILE, it was found that a $1,100 five-passenger touring car with a 4 by 4.5-inch four-cylinder motor equipped with an electric lighting and cranking system of the type in which the motor-generator armature forms the flywheel of the engine, ran 9.3 per cent. farther when the generator was not supplying current than when it was charging the battery at a rate of 15 amperes and headlights and taillight were lighted.

The tests consisted of two economy runs. A special tank was fitted to the dash of the car, the main tank being disconnected. Into the special tank was measured 1 gallon of gasoline. The head and tail lights were turned on and the car started by the electric cranker and run at a constant speed of 20 miles per hour until the gasoline was exhausted. The mileage reading then was taken on an uncalibrated odometer. The odometer showed 21.4 miles.

As the second test the first was repeated with all conditions the same except that the wires leading to the regulator were disconnected so that the generator was not supplying current to either the battery or the lights. The motor leads were connected to the battery just long enough to start the engine and immediately disconnected. According to the odometer, the car ran 23.6 miles under these conditions.

The lamp load in the first case included two 16-candlepower headlights and one 4-candlepower tail light of the ordinary tungsten type. The charging rate averaged 15 amperes, according to an uncalibrated ammeter, beginning at 10 amperes and rising to 16 amperes, the speed of the car varying between 19 and 23 miles per hour. The spark advance lever was at the same point throughout the tests.

Tabulated results are as follows:

With electric load.....21.4 miles per gallon
Without electric load.....23.6 miles per gallon
Increase in miles per gallon due to removal of electric load 2.2
Increase in mileage per gallon due to removal of electric load..... 9.3 per cent.

It must be remembered in considering these figures that the mileage with the electric load would have been greater if the electric installation were designed to supply only the headlights, instead of being designed for lighting five or six lamps and cranking the motor.

European Makers Discuss American Invasion

GENEVA, SWITZERLAND, July 8—At a meeting of the Union of International Automobile Constructors held here today the much talked of invasion of Europe by the low-priced American automobile was the chief topic of discussion. Representatives from Great Britain, France, Germany, Austria and Belgium attended the meeting.

The outcome of the discussion was that the only answer to the invasion would be increased efforts toward excellence in the European product. The American car was succeeding because of its good qualities. It was pointed out that no competition on a strictly price basis was possible with the European manufacturer.

No Paper Tags in Missouri

ST. LOUIS, MO., July 7—That the use of pasteboard license duplicate tags on automobiles in Missouri will lead to arrest and fine is the warning of Claude D. Long, automobile inspector of Missouri. The other day Long found a local dealer who had just issued a paper card duplicate license to a purchaser who was going to drive the car to Washington county in the state. Long made the buyer get a regular dealers' license plate. The St. Louis Automobile Manufacturers' Association, maintaining that the state has no right to force a dealer to supply a plate, will test the legality of the law soon. It is planned to start out a car without a license, but for which a license has been asked, and then have the driver arrested so that a friendly trial can be instituted.

DETROIT, MICH., July 7—Permanent headquarters have been opened in Detroit for the Lincoln Highway Association, which has been formed to secure the establishment of the Ocean-to-Ocean highway, a project started 2 years ago by Carl G. Fisher, of Indianapolis. Plans for the highway are rapidly nearing completion. Approximately $4,200,000 of the necessary $10,000,000 already has been subscribed.

BALTIMORE, MD., July 7—E. M. Denton, formerly an agent for the Chase Motor Truck Co., in Baltimore, Md., has just been appointed district manager in place of Mr. C. K. Thomas, resigned. Mr. Denton takes charge of his new office about July 1st. For the present he will make St. Louis his headquarters. His territory will comprise the greater part of the southwest, including Missouri, Texas, Oklahoma and Arkansas.

Market Changes of the Week

The past week was uneventful in the way of quotations for the various materials needed by the members of the automobile industry, the principal reason of this state of affairs being the holiday which practically nullified all trading for 2 days, and this effect was still enhanced by virtue of the manifold unfavorable news which took a great deal of security out of the stock market and by way of sympathy affected the materials market as well. Consequently, whatever changes took place were of a downward nature, although these changes were few. Perhaps the most important development in this respect was the decline of tin, which metal dropped 2 cents a pound between the beginning and end of the weekly period. Copper also suffered a drop, which, however, was only fractional. Japanese silk dropped likewise, while cotton seed oil despite very limited trading advanced slightly.

Material	Wed.	Thurs.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	26.50	26.50	26.50	26.50	26.50	.....
Copper, Elec., lb.	.14½	.14½	.14½	.14½	.14½	.....
Copper, Lake, lb.	.14¾	.14¾	.14¾	.14¾	.14¾	.....
Cottonseed Oil, lb.	8.42	8.40	8.40	8.41	8.45	+ .03
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 Gals.	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime.	.95	.95	.95	.95	.95	.....
Lead, 100 lbs.	4.35	4.35	4.35	4.35	4.35	.....
Linseed Oil.	.47	.47	.47	.47	.48	+ .01
Open-Hearth Steel, ton	26.50	26.50	26.50	26.50	26.50	.....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.....
Petroleum, bbl., Pa. crude	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.....
Silk, raw Italy	....	....	4.70	....	4.70	.....
Silk, raw Japan	....	....	3.87½	....	3.85	— .02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	41.38	40.70	40.70	40.70	39.38	—2.00
Tire, Scrap.	.09½	.09½	.09½	.09½	.09½	.....

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Cheaper Sixes for 1914

THE much-discussed six-cylinder movement, which has so generally permeated the ranks of high-priced automobiles during the last 2 or 3 years, is going to invade the cheaper field for next year. The $1,500 six is going to be seen much more generally than this year and when all 1914 announcements are made there will be a big showing of sixes listed under the $2,000 mark.

The course of the small six seems much clearer than it was at the commencement of the 1913 season. Last summer the rising price of gasoline was taking hold of many buyers. The fuel increased 50 per cent. in 6 months and the talk of 50-cent-a-gallon fuel by some gave the six a slight setback. This year the fuel sky is clear.

1914 will witness the dropping of a few of the very big sixes, in fact, as demand is shaping itself the movement is heading towards two styles of sixes, one ranging from $3,000 up and the other class from $1,000 to $2,000. Not a few who had sixes listing around $2,500 this year will list their small sixes for next year under the $2,000 mark. There will literally be a host of them listing around and under $2,000. It is going to have an effect on the four-cylinder market in the medium-price field.

Bringing sixes into this lower strata of prices will bring about more five-passenger sixes, to take the place of the seven-passenger machine that everybody tried to offer at the $2,500 price.

The Motor Highway

WITH over $4,000,000 of the necessary $10,000,000 for the construction of a trans-continental highway pledged and with active campaigns being waged in the interests of the fund it now seems certain that something definite will emerge from the movement launched last autumn. Although the majority of the subscriptions to date have come from motor organizations and manufacturers, an active campaign for general subscriptions has been started. This is the best aspect of the entire movement. A highway, such as outlined, should not be constructed entirely by the motor industry. It shows excellent enterprise that such a movement should be fathered by an industry that has done more for the nation-wide promulgation of improved highways than any other, but the highways are for all the people and as such the greatest good will be done for good roads if the majority of the people are interested.

If some public-spirited citizen undertook to build a transcontinental highway and present it to the nation, it is questionable if the road would be properly maintained after its presentation. Such presents would cultivate pauperism, the very thing to be avoided.

On the other hand, if a transcontinental highway can be built by general subscription, so that 10,000,000 citizens may participate in the movement, you have just that many boosters for the maintenance of such a road and the same number to argue good roads in other sections. Robert G. Ingersoll once said that "the hands that help are better far than lips that pray." Bringing this into the good roads field, we should look for general subscriptions and particularly by the states traversed.

Henry B. Joy, who has recently completed a surveying trip over a transcontinental trip from Detroit to San Francisco, has not as yet issued an official statement, but from what has been said it is certain that in many states there is much to be done. In not a few of the western states the states themselves are so sparsely populated as not to be able to build a satisfactory highway. Outside help will be needed. There are stretches in two or three places where 50 to 70 miles are traversed without passing a sign of habitation. Here is where outside help is needed.

The organization recently formed to promote an improved transcontinental highway must reckon with the support of the masses rather than the gratuities of the classes. Make use of both, have one complement the other. The most permanent results will follow. If assistance is given certain states in building their sections of the route, then arrangements must be made for the maintenance of such sections as well as the entire roadway. There is no reason why appropriations for maintenance should not be had from every county or state traversed and also federal assistance. California will naturally benefit enormously by such a highway and she should be willing to meet her share of the obligations. Colorado will benefit to a very great extent and so should be ready to carry her share. Do not make the proposed highway a developer of pauperism but rather a resurrection of the dry bones.

All Is Ready for National Reliability Run

Twenty-Four Entries In and Several More Are Probable —Arrangements for the Hotel Train All Complete— Sociability Features Emphasized—Fourth Grade Rules

BOSTON, MASS., July 7—When the Glidden tour starts from Minneapolis next Friday Charles J. Glidden of Boston, donor of the trophy, who has never yet missed one of these tours, will not be riding in the first car as an honored guest. Mr. Glidden is very busily engaged just at present with a large financial deal that requires his undivided attention.

MINNEAPOLIS, MINN., July 5—Plans are all set for the ninth annual national reliability tour of the A. A. A., leaving Minneapolis at 8 a. m., July 11, and ending at Glacier Park station, Mont., July 19. Twenty-four entries are in and half a dozen more are in sight. The Krit team drivers have arrived and the Metz team, six in all, will arrive Monday.

Arrangements are complete for the hotel train, which is a duplicate of the Great Northern Oriental Limited. The train will have a dynamo car, baggage, repair and supply car, newspaper printing car, six standard drawing room sleepers, two dining cars, observation compartment car. It will carry all baggage, furnish meals three times a day and lodgings at night. A daily paper will be issued, typewriters will be provided for the correspondents, photographers will have a developing room and all repairs for cars will be provided against. The train cost $250,000.

To Have Indian Pilots

Entertainment is to be provided by the commercial clubs at the night controls and over Sunday at Fargo. At the Sioux Indian reservation at Poplar, Mont., the Indians will give their annual pow wow, which they have held off for the tour. At Havre, Mont., a delegation of Piegan Indians will act as pilots to the end of the tour. At the camp of St. Mary's Lake a pow wow is to be given. The tourists will be in charge of special agents of the railroad company and under supervision of "Jim" Shoemaker, the personal representative of the road.

When the tourists have reached Glacier Park Hotel they will take a plunge in the big pool. Later they will drive thirty-two miles into the park, the finest park reservation road thrown open to the public, finished a year ago. The following day the automobiles will be loaded on freight cars and will be transported with the tourists by special train to Belton. This is at the south end of the park, and from that point the tourists will drive their cars over the Park-to-Park road to Kalispell. The various civic organizations there will pilot the travelers through the famous scenic Flathead Valley.

From that point tourists can return by special train, or drive to Yellowstone Park or to the west. A special freight rate has been made for return of automobiles.

While the visiting automobilists are in Minneapolis they will be entertained at the Bloomington Club and with a tour over the famous Minneapolis boulevards and through the lake region.

Sociability features are emphasized in the arrangements for the Minneapolis tour. Fourth grade rules have been adopted. Penalties will be assessed only for being late into controls. The eight day task of covering 1,300 miles has been divided up into short runs. In no one day will more than 163 miles be covered. The shortest day run is 123 miles. Racing and fast driving are barred. The tour will be a moderate jog. The most inexperienced driver is expected to find the trip a "picnic." Several entrants will take their families along. Under the rules people in the tour can ride on the train or in automobiles as they elect from day to day. An observation car will be taken.

The foreign entrants have begun to arrive. Frank Witt, member of the Krit team, came yesterday. The Metz family of Boston, members of the Metz manufacturing firm, will begin to come tomorrow. For the remaining days of the week the tourists will be arriving daily with their cars. The Automobile Club of Minneapolis is to entertain these visitors on Thursday with an automobile tour of the parkways and at luncheon at the Bloomington Club.

After the Glidden tourists have rested up at the end of the run, their automobiles will be loaded on freight cars behind the special train and will be carried through the mountains to Belton, the southern entrance to the park. Thence they will drive over the new Park-to-Park road.

Program of the National Tour

Minneapolis to Glacier Park station, Mont.
Distance—1,233 miles.
Date—July 11-19.
Sunday stop—Fargo, N. D.
Average daily run—154 cars.
Hotel and café—Twelve-car $250,000 train.
Make-up of train—Mogul engine, dynamo-baggage car, newspaper car, six 12-section drawing room cars, president's business car, compartment observation car.
Purpose of tour—For sociability, to promote good roads, to demonstrate touring qualities of entered automobiles.
Prizes—Glidden trophy for club teams of three; Anderson runabout trophy, for individual runabout entries; A. A. A. trophy, for touring car entries; *Daily News* trophy, for runabouts; special prizes for winners of seven price divisions for touring cars and runabouts respectively.

The complete list of entries in the tour is as follows:

No.	Name	Place	Model	Type
1.	L. W. Hill,	St. Paul	Packard	Tourabout
2.	L. H. Fawkes,	Minneapolis	Premier	Touring car
3.	Harry F. Legg,	Minneapolis	Stutz	Runabout
4.	L. H. Fawkes,	Minneapolis	Marmon	Runabout
5.	G. H. Voter,	Boston	Metz	Runabout
6.	Charles Metz,	Waltham	Metz	Runabout
7.	C. Walter Metz,	Waltham	Metz	Runabout
8.	N. W. Automobile Co.,	Minneapolis	Krit	Runabout
9.	N. W. Automobile Co.,	Minneapolis	Krit	Runabout
10.	N. W. Automobile Co.,	Minneapolis	Krit	Runabout
11.	Dr. C. A. Smith,	Devils Lake, N. D.	KisselKar	Touring car
12.	L. C. Erbes,	Merriam Park	Velie	Touring car
13.	R. W. Munzer,	Minneapolis	Hupmobile	Runabout
14.	R. W. Munzer,	Minneapolis	Hupmobile	Runabout
15.	R. W. Munzer,	Minneapolis	Hupmobile	Runabout
16.	J. A. O'Brien,	Minneapolis	Moon	Touring car
17.	E. B. Stimson,	Minneapolis	Little	Runabout
18.	Dr. E. W. Humphreys,	Moorhead, Minn.	Chalmers	Runabout
19.	Lewis C. Newlon,	Fairmont, Mont.	Maxwell	Touring car
20.	E. A. Everett,	Waseca, Minn.	Locomobile	Touring car
21.	F. J. Lyman,	Minot, N. D.	Chalmers	Touring car
22.	Dr. J. R. Pence,	Minot, N. D.	Ford	Touring car
23.	Mrs. Minnie Butchard,	Hibbing, Minn.	Velie	Touring car
24.	Dr. J. D. Park,	Duluth, Minn.	Locomobile	Touring car

PHILADELPHIA, PA., July 6—Preceding an elaborate parade of decorated automobiles on the principal streets of Wildwood, July 4, more than a score of cars participated in a secret time schedule run to the resort, for which silver cups were awarded. First prize was captured by George Johnson, Cole car; second prize, L. A. Graver, Hupmobile, and third, S. W. Harper, Moline.

The prize for the best decorated car was awarded A. H. Miller, Overland.

MEMPHIS, TENN., July 6—Don Grant, of Brinkley, Ark., driver of a racing automobile that was wrecked during the progress of a 100-mile race at Memphis Driving Park July 4, died last night of his injuries. His mechanician, John Harp, of Brinkley, is expected to recover.

SIOUX CITY, IA., July 6—Louis Disbrow, driving his Simplex Zip, yesterday afternoon, hung up a new world's record for 12 miles on a flat dirt track, at the Sioux City speedway, covering the distance in 9 minutes and 20 4-5 seconds.

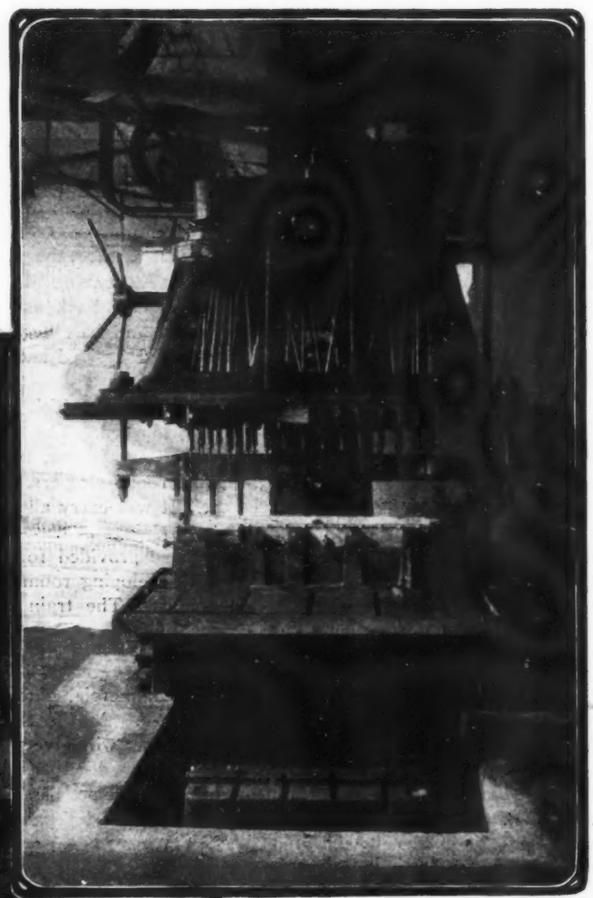
MANSATO, MINN.—The first sociability tour of the Automobile Club will be to the Country Club of the Minneapolis Automobile Club at Bloomington, on the Minnesota River. The clubs of St. Peter, LeSueur, Belle Plaine, Henderson, Jordan, Shakopee and Chaska have been asked to join. The run will be July 15.

A Drill with Fifty-Six Spindles

Reduces the Time Required To Drill a Crankcase from 90 Minutes to 3—Also Drills Oil Pans

A MULTIPLE spindle drill with fifty-six spindles which reduces the time to drill a crankcase from 90 minutes to 3 minutes, was recently installed by the H. H. Franklin Mfg. Co., of Syracuse, N. Y., manufacturers of Franklin automobiles. This machine was designed especially for the drilling of crankcases and oil pans, and is the only drill in this country with such a large number of adjustable spindles in one head. The adjustable spindles can be set at a very close range so as to take in all of their drilling, the machines being designed particularly for drilling at high speed and for the drilling of aluminum.

The machine has a gear drive throughout with a force feed for lubricating. The dimensions of the head will drill 20 by 45 inches. The machine, while massive in construction, can be operated by one operator and the jigs are so designed that nothing has to be handled but the part being drilled.



The jigs are designed in such a way that the work can be produced in about one-thirtieth of the time it formerly took for the same operation. Finally the holes in the crankcases were drilled one at a time, where now the entire drilling of 120 holes is done in two operations.

The range of drilling speed is as follows:

364, 437, 548, 820, 984, 1340 r.p.m.

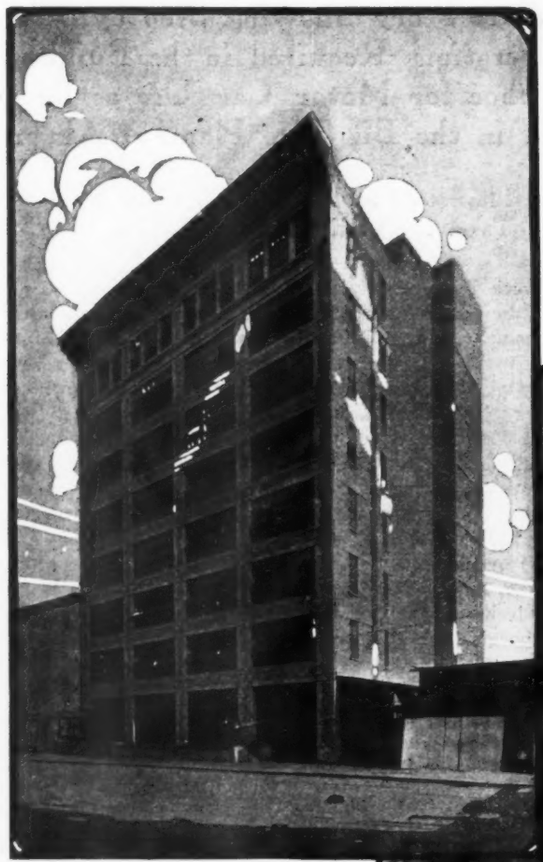
These speed changes are taken through a gearbox which is located at the base of the column. The drill is ball and roller bearing throughout. The gears are of the tumbler type constantly running in oil. There are six changes of feed from 1.34, 2.05, 2.74, 2.89, 4.82, and 6.28.

An idea of the proportions of this drill is clearly given.

The head of this machine and method of handling was planned by the Planning Department of the Franklin company, and the machine was designed and constructed by the Fox Machine Co. of Grand Rapids, Mich.

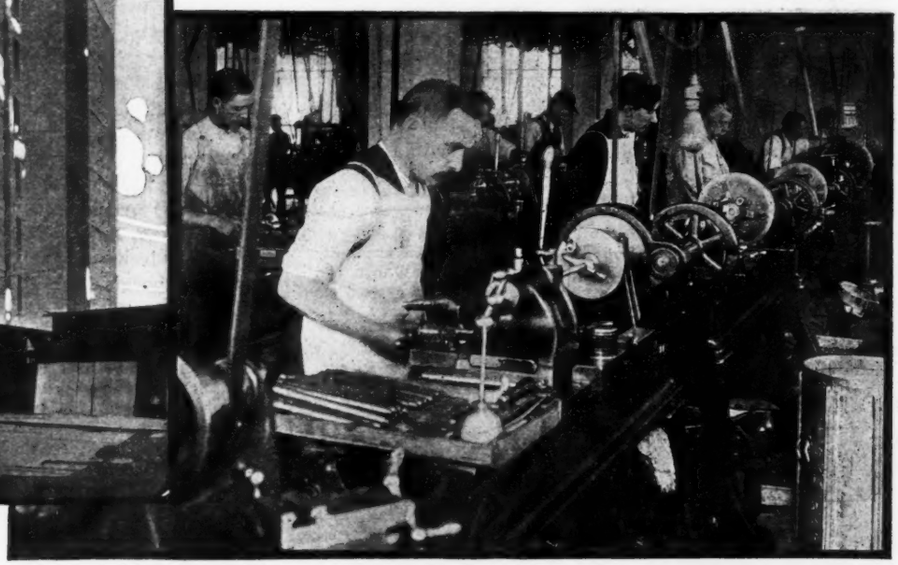
Hartford Suspension Co.'s New Plant

Structure Recently Opened Is of Concrete, Steel and Glass—Plenty of Light and Air for Workmen



THE Hartford Suspension Co.'s new building in Jersey City, N. J., recently completed, is of the modern fireproof type. The structure is of concrete, steel and glass and embodies every modern feature of an up-to-date plant which makes for large and economical production. The leading manufacturers throughout the country are now building on this plan, giving them added light and excellent working rooms, as may be seen in the accompanying illustrations. Congestion is dispensed with and the workmen have lots of elbow room in which to work. This is absolutely necessary where fine workmanship is needed.

The Hartford company recently celebrated the opening in complete operation of its new plant for the making of Hartford electric starters and lighters, for while the eight-story building has been turning out the devices for the past 4 months, all the machinery had not been installed and all the departments in full working order until a month ago. The stories are 12 feet high, giving ample room for the installation of the large machines required in handling the starter. The floors are made of granolithic material.



The illustrations show a model working layout. These rooms are equipped with the newest and finest of automatic machinery, the president of the company, E. V. Hartford, having long been a believer in making as much of his own product as possible, buying little or nothing from the outside. The many products of this company are made entirely at the factory.

The construction of the building is of the best material, of the beam and girder system, column supports on each floor being from 17 feet to 18 feet tall and 6 inches apart. The entire building is of re-inforced concrete with hollow tile walls, with an outer layer of 8 inches of concrete on three sides of the structure. The fourth side is so built that an additional wing can be easily added. Concrete stairways and standard fireproof underwriter's doors furnish ideal protection for the employees and the cars and electrical apparatus in the building against danger of fire which might break out there.

The Making of a Tire Casing

Part II

A Picture Story Showing, Step by Step, the Operations Required in the Building of a Shoe for Motor Car Use as Performed in the Big Tire Plants at Akron

Illustrated from Photographs Specially Taken for THE AUTOMOBILE

LAST week THE AUTOMOBILE published a picture story showing the operations which in their proper sequence constitute the manufacturing process of an inner tube. That portion of the tire having been dealt with, it now remains to take up, in the same manner, the making of a tire casing. This is shown by illustrations taken at various tire factories.

The manufacture of a tire casing may be divided into the making of the fabric layers, the mounting on them of tread and bead and the vulcanizing of the entire assembly. For this work, a multitude of appliances are used, including winding, cutting, heating and other machines; so that most of the operations are being done by machines, human labor being used only for the control of the same. There are, however, a few operations in the cases of which mechanical operation has not been made possible as yet, although this will most probably be realized in the future.

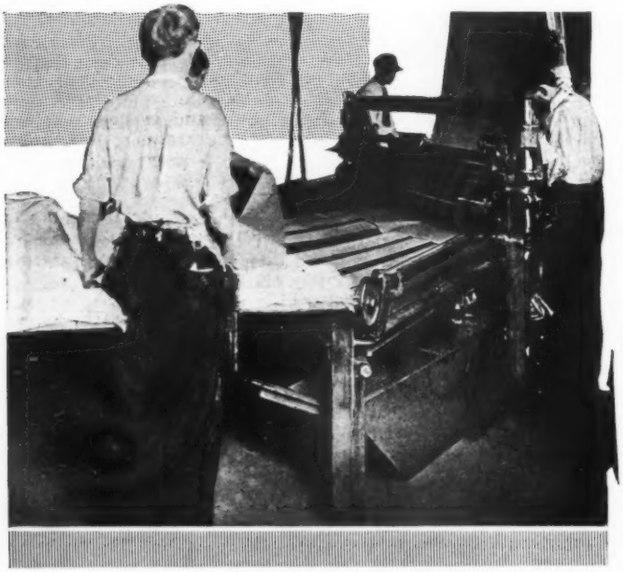


Fig. 1—The foundation of the pneumatic tire is made up of a number of layers of the rubberized fabric. From the calenders this fabric is sent to the tire department in large rolls. Here it is cut on the bias into strips wide enough to extend over the crown of the tire from side to side. Goodrich factory

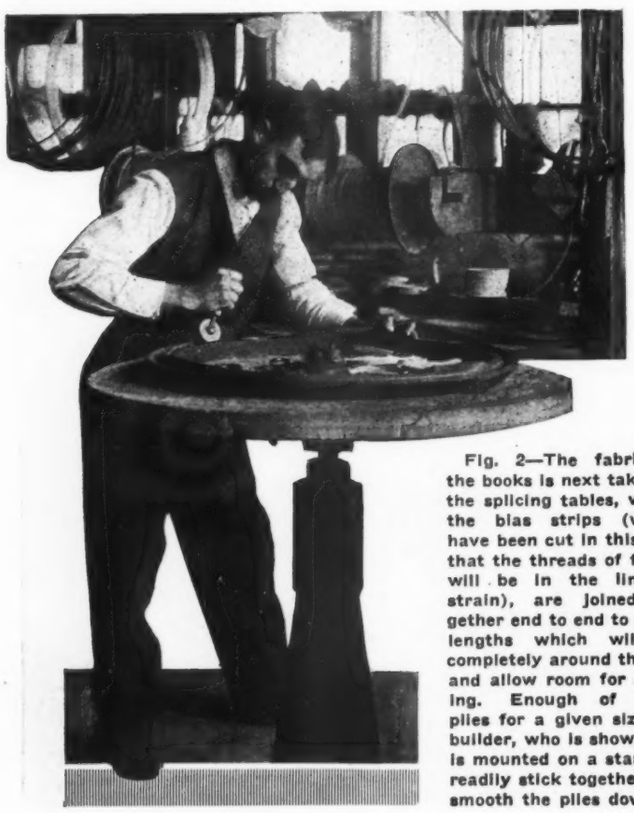


Fig. 2—The fabric in the books is next taken to the splicing tables, where the bias strips (which have been cut in this way that the threads of fabric will be in the line of strain), are joined together end to end to make lengths which will go completely around the tire and allow room for splicing. Enough of these plies for a given size tire are then placed together between cloths and sent to the tire builder, who is shown in the operation of evenly putting the first ply around a core, which is mounted on a stand. The first ply must be cemented to the core, but succeeding plies readily stick together without cement. The tire builders have special tools with which to smooth the plies down uniformly. Scene in Republic works, Youngstown

Fig. 3—Beads are an essential part of the casing and the operation of making these is shown above, as done in the Goodyear factory. The stiff, frictioned material is prepared in strips wound upon spools. The operator builds up the bead from this spooled stock in a mold, using a hand roller as illustrated. The view was taken in the Goodyear factory

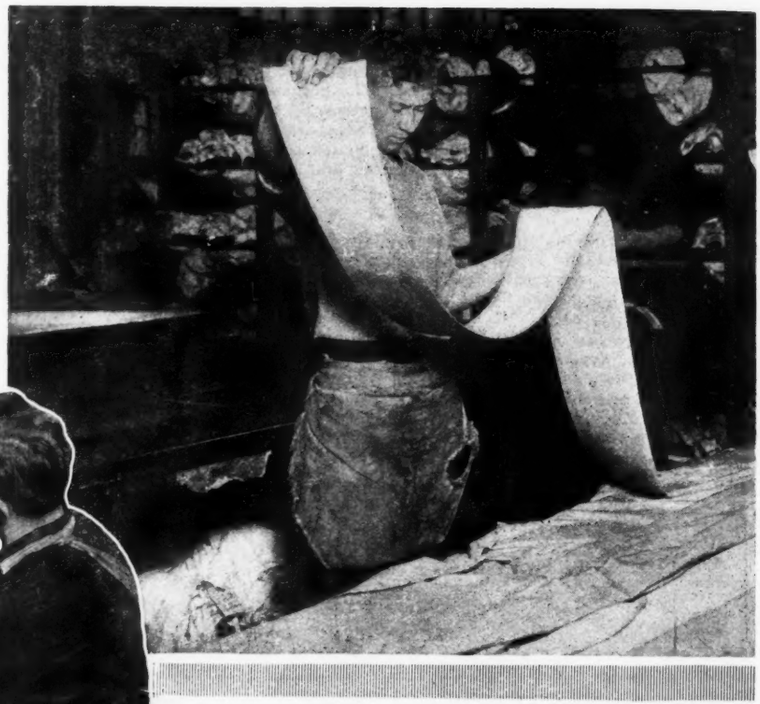


Fig. 4—Putting the bead in place. After several plies have been carefully laid on, one over the other, the bead is inserted and the edges of the next layer of fabric worked down over it, thus holding it in place, as here depicted. The location of the bead with respect to the layers of fabric is dependent upon the number of plies to be built up and the size of the tire. Although the building of tires requires much skill, adept men become expert at the work in 2 or 3 months, and they draw as high wages as any in the tire branch of the rubber factory. Photograph taken at the Swinehart plant in Akron. It should be noted that as men acquire skill in this work, their capacity for it increases rapidly, so that in the course of a relatively short time they become very efficient in this operation

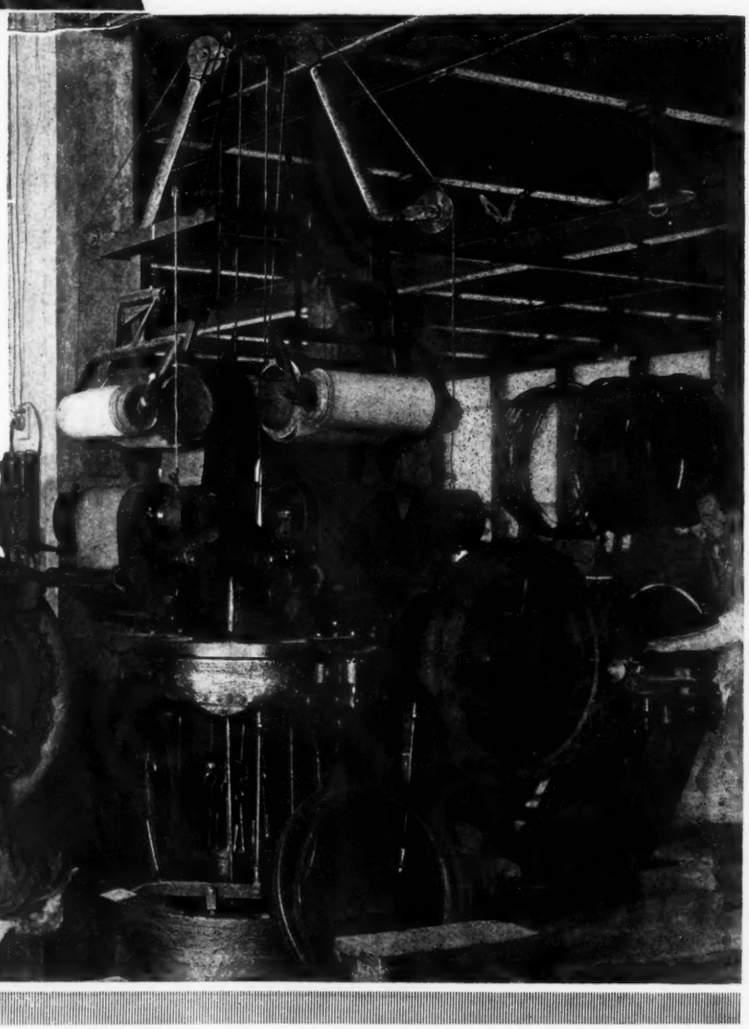


Fig. 5—Several of the factories have machines for the building up of the layers of fabric on the iron cores. One of the tire building machines in the Goodyear plant is here shown. For use in these machines the spliced plies of fabric are on spindles and placed in them. The core is first fixed to a stand which is part of the machine and so constructed that the core may be revolved, rolling the fabric from the spindle on to this form under a uniform tension. After each layer is rolled around the core, it is next rolled down by small rollers power operated. The bead is put in before the core is removed from the stand and the resulting built-up carcas is the same as that made by the hand process.

Fig. 6—After the fabric has all been put on and the beads worked into place, the cover rubber is next applied in strips, being rolled down and lapped with hand rollers in much the same way as the fabric is applied by the hand process. The laying on of this cover material is entirely a manual operation. In the view at the right a strip of cover rubber is shown. It is being taken from the cloths preparatory to its application to a partially built tire. Photographed in the Swinehart factory.

Fig. 7—Two ways of tire curing are generally employed, the single-cure and the double-cure methods. In the former the tire is completely built up and vulcanized at one time; that is, after the cover strips of rubber have been put on, a breaker strip of fabric is applied, and finally the heavy tread, which is built up independently of the tire, is put on. The process of building of the tread is shown in this view from the Republic factory. The narrow strips of rubber are cut in different widths as shown. These are built up one over the other, with the widest at the bottom and each succeeding layer being narrower. Thus the tread is thickest at the center and slopes down to thin edges at the sides of the tire

Fig. 8—The built-up tire next goes to the curing room, where it is placed in a mold, the core still remaining within it. This view shows a number of the iron molds, each containing a built-up tire, being put into the large boiler-like heater, the molds being piled one on top of the other on a table or platform which is made to sink further down into the heater as more of the molds are put on. From sixteen to twenty molds, dependent upon the size, are put into the vulcanizer, after which the cover is locked on and the molds all forced together by hydraulic pressure for the 3 hours during which they remain in the heat. This view was taken in the Republic plant. As the illustration shows, this machine calls for the services of two men, while charging and discharging, and one while the tires are in the heater

Fig. 9—Having remained in the heater under pressure for the necessary time, the cured tires are taken out and removed from the molds. The above view shows a vulcanized tire just before it is taken from the mold. The heater is also seen. It is one of those used in the Goodrich factories; the cover raises, but is not removable as in the previous case. Coming from the molds, the cores must next be taken out of the tires, after which the inside is painted with a talc mixture, the seam being trimmed off and the tire cleaned

Fig. 10—As the name indicates, the double-cured tire has two separate vulcanizations. For the first of these the tire is built up the same as the single-cured variety, except that the tread is not put on. Having the rubber side walls and cover in place over the fabric, the partially finished tires are put in the molds as here seen, after which they are loaded into the heaters and heated in the usual way with hydraulic pressure, holding the halves of the molds together firmly. But the period of vulcanization in this case is only long enough to partially cure the rubber. View in Swinehart plant

Fig. 11—Loading the vulcanizers at the Firestone plant for partial cure of the tires. The molds are carried to the mouth of the heater on a long table flush with the top of it, making it comparatively easy to shove the molds into place. The molds on being taken out are unloaded on to a table on the opposite side. With the type of vulcanizer here used the head can be completely removed

Fig. 12—The partially cured tires, after being removed from the molds, are mounted on buffing machines, as

here shown. The cores still remain within. They are slowly revolved while that part of the rubber covering which is to be under the tread is roughened with a heavy file. Over this rough surface one or more coats of cement are applied and allowed to dry, thus making a surface to which the tread will cling when applied. Scene in the Goodyear factory. This is also one of the operations which are at present being done by hand, because up to this time no method has been evolved of automatically filing and cementing the tire casings

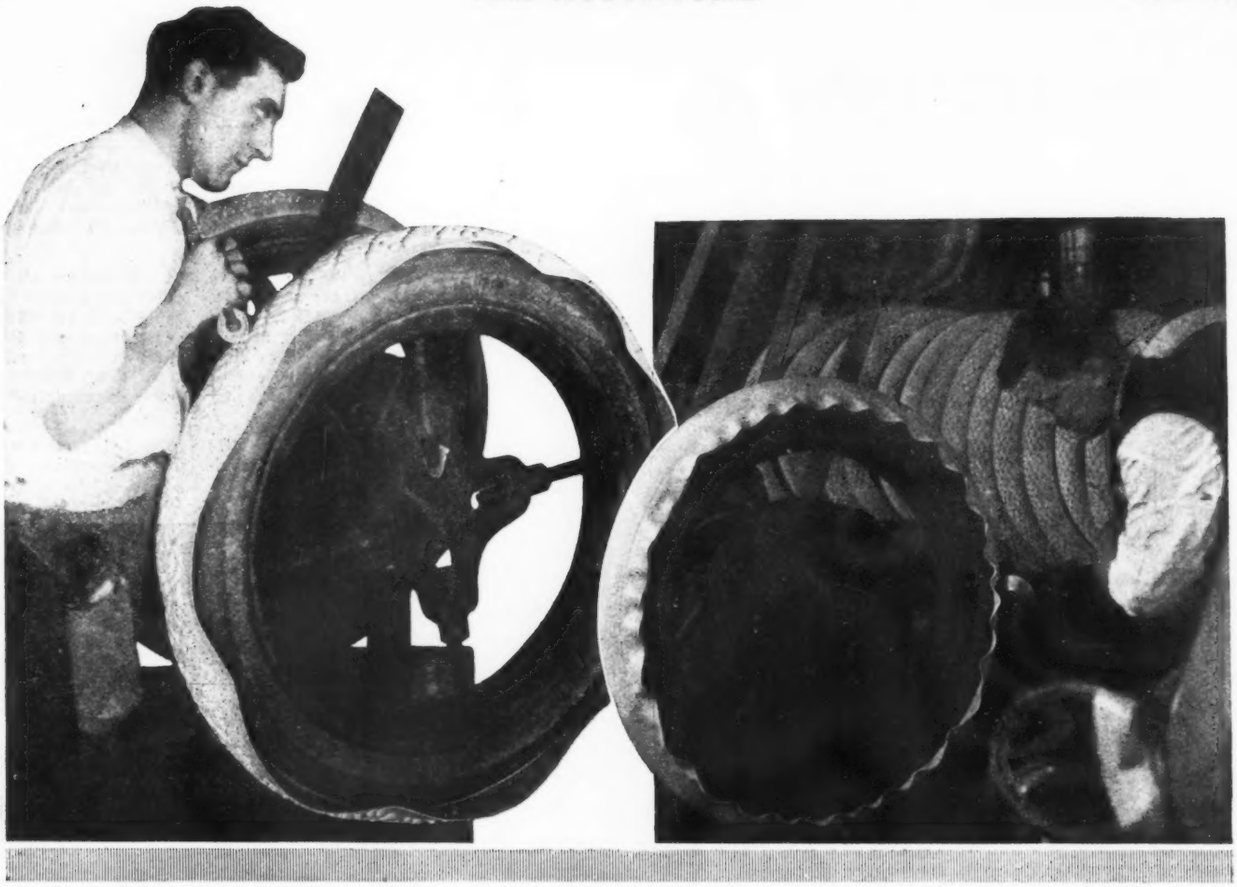


Fig. 13—Next the tread is put on and carefully worked down with a hand roller as illustrated. The stock used for this tread is a rubber compound which is intended to cure quickly so that in the final heating process it will be completely vulcanized as soon as the rest of the tire, already partially cured. Firestone view

Fig. 14—Putting on treads at the Goodyear plant. The operator is in the act of rolling down the tread smoothly around the partially cured and buffed tire. Although the tread is rolled down by a roller that is operated by hand, it is in this case held by a bracket so that it has only a horizontal motion

Fig. 15—After the application of the treads, the tires are cross wrapped with cloths under tension. The view above, taken in the Swinehart plant, shows the method of wrapping these cloths around the core, which remains in the tire during the final vulcanization. There is another method in which an air bag replaces the core within the tire for the second vulcanization

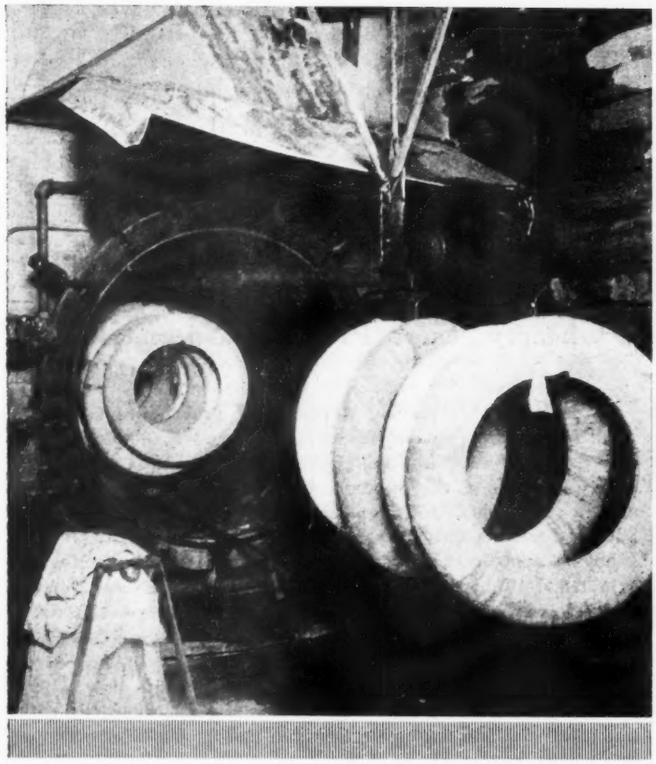


Fig. 16—The tires being wrapped are now ready for their final cure. The illustration shows one of the final vulcanizers at the Swinehart works. The heater is mounted horizontally and the tires are suspended within it by hooks from a conveyor running outside. This second vulcanization lasts about one-third as long as the first, or about 1 hour. On removal from this vulcanizer, the cloths are removed, the core taken out and the tire cleaned and its inside painted with talc, after which it is ready for market

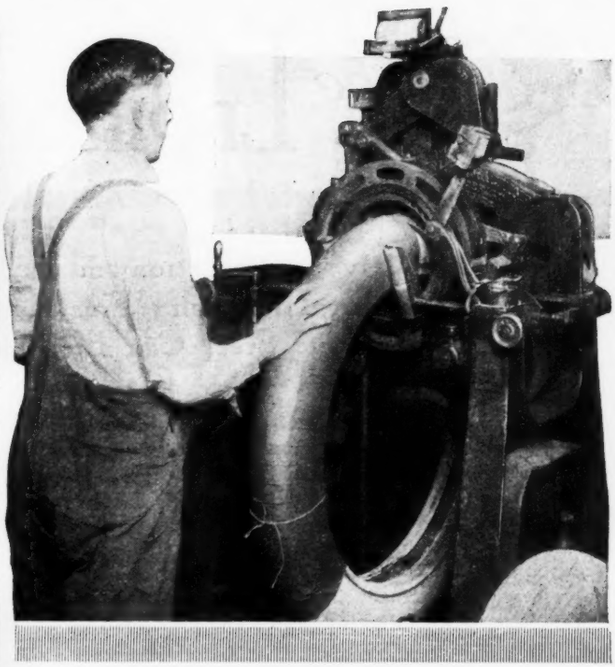


Fig. 17—Several of the rubber companies wrap their tires with paper before shipment. The method of doing this with a special wrapping machine is shown above. The circular device, seen at the top of the machine with its axis perpendicular to that of the tire, carries the paper ribbon and revolves around the tire, which is also moved slowly around. The revolving paper carrier is split and can be opened up to allow the removal of the tire. About seventy-five large tires can be wrapped with this machine in 1 hour. It was photographed at the Republic factory, Youngstown. The use of this machine makes for maximum efficiency in the wrapping department, inasmuch as there is only one man required for operating it; or, rather, supervising its operation

Fig. 18—This view shows a number of Akron workers employed in manufacturing tire casings. The faces and figures of the men are typical, the individuals having been selected as representative and illustrating the healthy, brawny type of laborers who produce the tremendous output made at the Akron factories. Photograph taken at the Goodyear factory

The Engineering Digest

Four-Wheel-Drive Construction and the Field for It—A Check Upon Careless Autogenous Welders—Dieterich's Fine Results from Benzol Mixed With Volatile Naphta—Electric Steel Can Be Made Cheaply, Says Practical Specialist

MECHANICAL Four-Wheel-Drive from Internal-Combustion Motor—It is widely understood that mechanical complication, high cost of production and a large upkeep cost due to the wear of the extra parts and joints are the principal factors which have so far operated against the manufacture and use of motor trucks in which all four wheels are driven and that this accounts for the fact that most trucks of this description actually in commission are of the electric or gas-electric types in which the complication referred to is at its minimum. The advantages of the four-wheel drive system in the way of climbing steep hills with large loads, for pulling a loaded trailer and for securing traction where the road surface is slippery or very soft or rough are, on the other hand, recognized. When the advantages and the disadvantages are balanced against each other, with reference to the line of work for which a truck is intended, the comparison has so far in most cases been against the four-wheel-drive, but when the drawbacks are reduced by improved construction and when the contemplated work absolutely includes hauling which cannot be done by the customary two-wheel-drive system, the scales are likely to be tipped in favor of the four-wheel-drive in one form or another, the comparison being then between four-wheel-drives as worked out for the different power and transmission systems—steam, gas, gas-electric and storage batteries—on one side, and, on the other side, nothing more attractive to choose from than a "caterpillar" or "pedrail" wheel system, horses and, where the radius of the traction difficulties is short, derricks or cranes.

On these grounds, the military authorities in European countries are much interested in developing the four-wheel-drive taken direct from an internal-combustion motor, mainly with a view to work in the African colonies of the respective countries, for the present, but with the idea in the background that the four-wheel-drive, once perfected through the experience gained in the roadless colonies, would considerably enlarge the range of work which could be done by motor trucks in any country, normal economy as well as emergencies being considered. A certain saving in cost of tire upkeep, for example, is looked for, owing to the better distribution of loads possible with the system and the reduced quota of traction resistance to be borne by each of the rubber rings—a factor of considerable importance for heavy hauling, as evidenced through the superior economy effected by the use of twin tires and other means for enlarging the area of rubber exposed to wear.

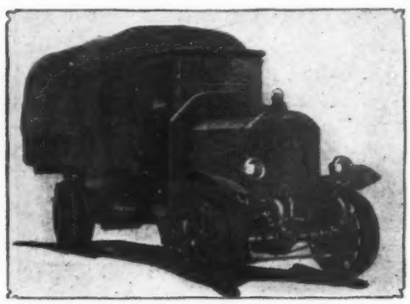


Fig. 1—Latest Daimler four-wheel-drive truck, built for Spanish army in Africa

For the work of hauling stones, sand, gravel, ore and clay from quarry or mine and for excavating and roadbuilding, the considerations which the military authorities have in mind also hold good, and, as the mechanical resources of vehicle builders as well as the insight of engineers in the requirements have now advanced to a point where the avoidance of numerous little annoying blunders in the mechanical design may confidently be expected, the question of the manufacture of four-wheel-drive trucks has in fact entered upon a new stage. Nevertheless such a possibility as that of driving the front wheels by a separate small power plant or by a generator-motor equipment, also used for starting and lighting, and switching it into use only when needed, has not yet come to the surface. The problem is still concentrated upon so perfecting the mechanical elements in leading power from one motor shaft, through a change-gear box, to four wheels, that the mechanism will not be subject to extraordinary wear and stresses.

Dr. A. Heller of Berlin offers an account of the progress made in this respect by the German Daimler company and by the Panhard company in France. The truck with four-wheel drive and four-wheel steering turned out by the Panhard company has been described in these columns (issue of March 21, 1912). The information relating to the Daimler truck shows at once how slow the development has been and how isolated from that of ordinary commercial vehicles.

The design dates back to 1903 in its general features. In 1904-1905 an armored car with a rapid-fire gun and built according to this design at the Vienna branch factory was found to operate to satisfaction. Two trucks of similar construction took part in road tests conducted in 1907 for the Prussian army and proved superior to the other vehicles in the test by their freedom from skidding. On the basis of these experiences there was built in 1907 at the Marienfelde factory a passenger car for service in the colonies, and on a trial trip over 1,600 kilometers it overcame all surface and traction difficulties encountered. Another vehicle for the same class of work was built in 1909 and is now in use as a heavy truck with trailer drawing payloads from 10 to 15 tons. The same year a chassis was made for the Krupp steel company, who placed a high-elevation gun for use against balloons on it. This vehicle was capable of a speed of about 60 kilometers per hour and by reason of the great mobility of its running gear and the four-wheel-drive could pass over very rough unprepared ground and steep gradients. Each of the following years the Krupps have turned out another vehicle of the same class. Finally there has been built and delivered this year a truck with all the latest improvements for the colonial service of the Spanish army.

[Dr. Heller describes and illustrates the 85-horsepower motor equipment which is specially arranged for the security of the service under tropical and uncivilized conditions—and it is at this point that the latest improvements are most notable—and the general arrangements of the vehicle, which are similar to those of normal subsidized German army trucks, but with regard to the four-wheel drive system only the following details among those given, are of direct interest.—ED.]

The clutch shaft drives the primary shaft I of the four-speed change-gear mechanism illustrated in Fig. 2 (second gear-shifting fork not shown), and from shaft II underneath it the power is transmitted through a pair of fixed gear wheels to shaft III which extends both fore and aft through universals and constitutes the drive shaft of the vehicle. It is noticed that an extra gear reduction is gained incidentally by thus dropping the drive shaft to a level from which it can extend both forward and rearward. The rear shaft goes to a differential with transverse shafts which drive the rear wheels by means of pinions on the ends of the shafts and a gear ring inside of each brake drum. The forward shaft goes to a differential built into the front axle, and transverse shafts connect on each side by bevel pinion with the upper bevel pinion secured upon the end of a vertical shaft journaled interiorly in the tubular steering-pivot bolt. A bevel pinion on the lower end of the same vertical shaft drives the wheel through a bevel gear ring.

The front wheels have auxiliary rims, as shown in Fig. 1, which are useful when the vehicle is driven through sand and which may be studded to assist in preventing skidding or securing traction. The differential of the rear wheels may be locked. Both front and rear axles are braced by oblique struts running to the middle of the frame, so that springs and universals are not called upon to absorb driving stresses.—From *Zeitschrift des Vereines Deutscher Ingenieure*, June 7.

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HOW to Discover Flaws in Autogenous Welds—Having found that autogenous welds which were apparently smooth and perfect frequently showed fissures, unjoined spots and slag inserts when broken open and that these imperfections affected the strength of the joints materially, a Mr. Stadler sought means for discovering such flaws by convenient inspection methods. Through experiments he finally arrived at a chemical test which he considers satisfactory. It consists in removing a thin film from the surface of the weld by etching with a mixture composed of 100 grams of water, 5 grams of chemically pure nitric acid and 5 grams of chloride of potassium. The results obtained are sketched in Fig. 3, in which A_1 and A_2 represent two iron plates welded together along the seam *b*. The work was smoothed by filing and no trace of imperfections was visible until the acid test was applied. Then appeared plainly the flaws indicated by the letters *c*, *d*, *e* and *f*. The uneven expansion of the iron caused by a jerky advancement of the flame is indicated by the wavy formation marked *c*. Unjoined portions of the work are marked *d*, failure of the weld metal to fuse with the edges of the seam are marked *e* and a slag insert is marked *f*. The etching also showed a coarse crystalline structure along the seam blending into the normal and more finely grained structure farther away.

The acid imparts to the material of the work a light-gray tone on which the flaws show plainly; the failures to join, *d* and *e*, as black lines, and the slag inserts, which are not affected by the acids, as glassy conglomerations. Burnt spots show gray within a ring of dark crystalline structure. The cost of applying the test does not exceed 50 pfennig (12½ cent), says Mr. Stadler.—From *Oel- und Gasmaschine*, June.

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RECENT Progress in Industrial Pyrometry—An article under this title by C. R. Darling is published in *The Engineer* of June 13. He describes new instruments, mainly American, which are based upon the experience that a greater practical accuracy can be attained by using thermo-electric couples made from base metals and of relatively large dimensions than by depending upon couples made of metals of the platinum group and so small that the motive force transmitted to the indicator or recording stylus is liable to be absorbed in the resistance to motion of the latter unless the mechanism at this point is so delicately poised as to resist the wear and tear of ordinary shop methods poorly. Resistance and optical pyrometers are included in the review, and present practical improvements equally worthy of note.

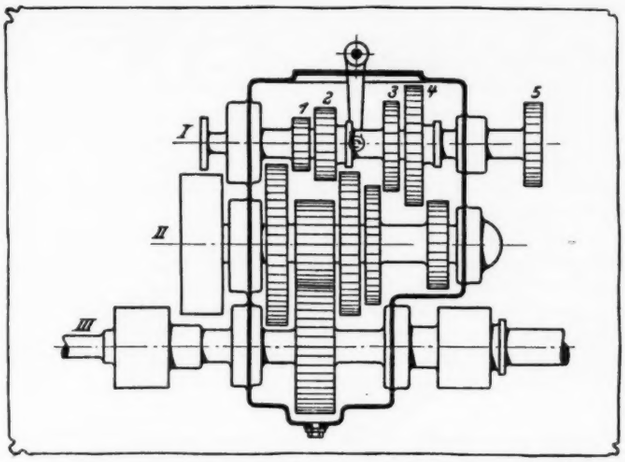


Fig. 2—Transmission gear with drive shaft underneath for four-wheel drive, German Daimler design

IMPROVEMENT of Benzol and Gasoline of High Specific Gravity Through Admixture of Petroleum-Ether.—By a series of practical experiments Dr. Karl Dieterich of Helfenberg, Germany, undertook to find out if the drawbacks attaching to the use of benzol and of "Schwerbenzin" (corresponding to gasoline of high specific gravity) in automobile motors could be removed by admixture of some other hydrocarbon fluid.

[As "Schwerbenzin" is commonly termed "Naphta" in Germany, while petroleum-ether is more widely known as "Gasolin" or "Gasäther," but is usually called "naphta" in the United States, and on the whole the greatest confusion obtains in the nomenclature for the products of petroleum distillation, not only as between different countries, but also with regard to the popular, the trade and the scientific terms for the same fluid in any one country, all the terms used in this article are identified by the chemical composition of the fluid to which they are applied in each case, and for simplicity the term "heavy gasoline" is used to denote what the author calls "Schwerbenzin," and "gasoline" to denote "Motorenbenzin" which is practically identical with American gasoline of a specific gravity from .680 to .720; or at least with the fluid which has been sold here in past years under the name of gasoline. It does not seem very improbable that one of the two admixtures which Dr. Dieterich found most suitable for an automobile motor—that composed of equal parts of heavy gasoline and petroleum-ether—may be somewhat similar to or almost identical with the fluid now sold for gasoline in America and said to be produced by a new method for combining some heavy and some light ingredients of crude petroleum. The interest in Dr. Dieterich's experiments would in that case attach mainly to the fact that he obtains still better results by mixing 1 part of petroleum-ether with 2 parts of benzol, this mixture being the cheaper of the two and composed mainly of a fluid—benzol—which is not under control of the petroleum refiners, at least not directly.—ED.]

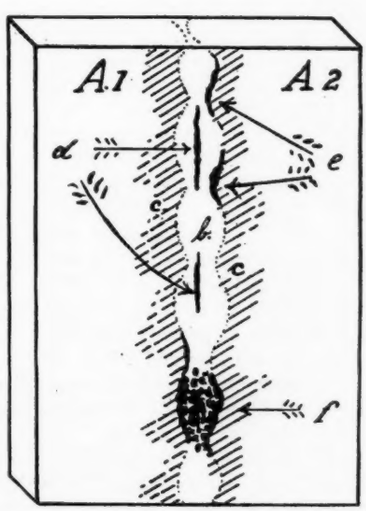


Fig. 3—Autogenous weld laid bare

An Opel car with a 70 by 100 bore and stroke four-cylinder motor was used for the tests. The carbureter was of the type commonly used

with this car. The different tests were made over the same stretch of road, 10 kilometers long, under the same temperature and weather conditions, and the fuel consumption was measured by using a graduating tank. The highest speed and the speed on the mountain grades were measured separately in each case. The car was fully loaded and the route was mountainous, which explains the very moderate speeds.

The nature of the fuels tried and the results obtained are summarized in the following:

(1) Ether, being ordinary ethyl ether made from alcohol and sulphuric acid, $C_2H_5O\ C_2H_5$, containing about 70 per cent. of carbon, 8 of hydrogen and 22 of oxygen, specific gravity .718 to .725, calories 9,000 per kilogram, price in Germany, minus the tax, 80 pfennig (about 20 cent) per kilogram. Used as fuel, unmixed, quickly stalled motor, mainly by reason of the great cooling produced by the rapid evaporation of this highly volatile liquid.

(2) Petroleum-ether, C_5H_8, C_4H_{10}, C_5H_{12} (mainly the latter, the pentane), containing 85 per cent. carbon, 15 of hydrogen, gravity .650 to .680, calories 11,000, price 62 pfennig (15½ cent). Results poor, as under (1). Price too high, anyway.

(3) Ordinary gasoline, $C_nH_{(n+2)}$ (hexane, heptane and octane), carbon 85 per cent., hydrogen 15 per cent., gravity .680 to .720, calories 9,500 to 11,000, price 56 to 58 pfennig per kilogram (14½ cent). Produced a high speed of 50 kilometers per hour with a consumption of 1 liter for 8 kilometers. The usual advantages over benzol and heavy gasoline in the way of responsive acceleration and the greater power arising from rapid flame propagation.

(4) Heavy gasoline, $C_nH_{(n+2)}$ (octane and higher grade paraffine), carbon 85, hydrogen 15, gravity .730 to .760, calories 10,500, price 46 pfennig (11½ cent). Produced a high speed of 44 kilometers and a consumption of 1 liter for 7 kilometers. Motor lazy and acceleration slow.

(5) Benzol, C_6H_6, carbon 92, hydrogen 8, gravity .8997, calories 9,500 to 10,000, price 32 pfennig (8 cent). Gave 9 kilometers to the liter but a high speed of only 42½ kilometers. Same drawbacks as with heavy gasoline. (The inconveniences arising in winter from the high freezing point of benzol and the possible effects with regard to fouling of the motor did not come within the scope of the test).

(6) Heavy gasoline and ethyl ether, equal weight parts, price 63 pfennig (16 cent). Results poor; very little power.

(7) Same ingredients, proportion 1 to 1½, price 71 pfennig. Results poor, showing ether to be useless for admixture, apart from price considerations.

(8) Heavy gasoline and petroleum-ether, equal parts, gravity .701, calories 10,000, price 54 pfennig (13½ cent). Gave 8 kilometers to the liter, high speed 45 kilometers. The acceleration was better than with heavy gasoline alone.

(9) Same ingredients, proportion 1 to 1½. The results were almost as poor as with petroleum-ether alone.

(10) Benzol and petroleum-ether, 1 to 1½, gravity .705, calories 10,750, price 54 pfennig. Gave 8 kilometers to the liter, high speed 48 kilometers. Acceleration and results generally better than with benzol alone.

(11) Same ingredients, equal parts, gravity .725, calories 10,500, price 47 pfennig. Gave 8 kilometers to the liter, high speed 50 kilometers. Took grades on third speed which with ordinary gasoline required second speed. An important improvement upon unmixed benzol, at all events.

(12) Same ingredients, proportion 2 to 1, gravity .797, calories 10,300, price 40 pfennig (10 cent). Gave a little more than 8 kilometers per liter and a high speed of 54 kilometers. Took all grades with higher gears than possible with other fuels. Good acceleration and lively explosions. Better than ordinary gasoline of .680 to .720 gravity.

Dr. Dieterich recommends that the mixture of 2 parts benzol with 1 part of petroleum-ether, which he finds superior to any other fuel, mixed or unmixed, be tried by others with different cars and carbureters.—From *Automobil-Rundschau*, May 31.

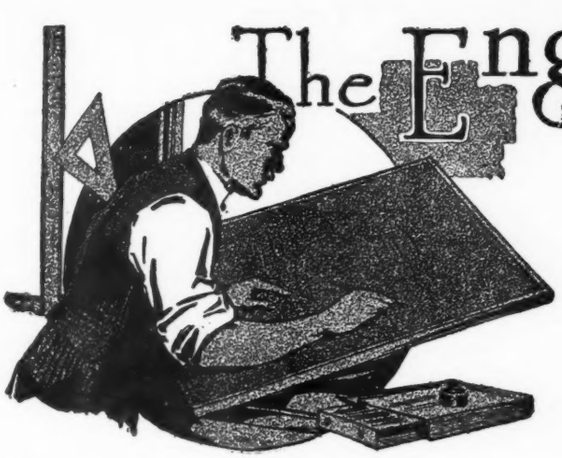
ELECTRIC Steel in Competition With Open-Hearth Steel.—Director Eilender of the Lindenberg steel works at Remscheid, Germany, recently explained at a lecture, which is reproduced in *Stahl und Eisen* of April 10, what chances there are, in his opinion, for electrically refined steel driving open-hearth steel out of the market. He holds it to be a certainty that the electric steel will entirely replace all the high-priced crucible steels, but in the competition with open-hearth steel the cost of production is the stronger factor.

Decisive results are looked for by operating Thomas converters in conjunction with the electric furnace, as the cost of current for refining Thomas steel has been demonstrated to be very low. In the case of mild steel, the current consumption curve for refining a solid charge by the basic method ranges from 1,000 kilowatt-hours in a 1-ton Heroult oven down to 670 kilowatt-hours in an 8-ton oven. The corresponding figures for acid steel range from 900 to 580 kilowatt-hours. With a molten charge, poured from the converter into the electric crucible, the current consumption for basic steel goes down to 400 kilowatt-hours in a 1-ton furnace and to one-half of this in a 6-ton furnace, while a molten charge for acid steel requires only 120 kilowatt-hours in a 6-ton furnace. The figures for the basic method are purposely placed high in order to include those cases in which specifications calling for a very low percentage of impurities render necessary an oxidizing process in the electric crucible. In order to arrive at an estimate of the total cost of refining the steel as it comes from the converter, not only current-cost must be figured but also the cost of ore, lime and sand admixtures, of the ferro-manganese and the ferro-silicon, the cost of making-ready and of upkeep and repairs, the electrode consumption and the wages and finally interest and amortisation.

The price of current amounts to about 2 1-2 pfennig per kilowatt-hour and each melt of the basic furnace is figured to last 2 1-4 to 2 1-2 hours, while the time for acid treatment is only 1 1-2 hour. For furnaces of up to 20 tons' capacity a certain progressive saving in current-consumption is estimated, though definite data are lacking on this point [at the German plant with Heroult-Lindenberg furnaces from whose operations the information is derived], and, all these things considered, the cost of electric refinement comes to 11.78 mark per ton for treatment in a 5-ton furnace for basic steel, ranging down to 9.03 mark per ton if a 20-ton furnace is used, and to 7.57 mark, ranging down to 5.28 mark, for acid steel. In these figures there is not included about 12 mark per ton for de-oxidizing the basic steel in a 5-ton furnace, which work however may be done for 9 mark in a 20-ton furnace. On the other hand, there should be deducted the cost of de-oxidizing and carburating which is ordinarily done in the Thomas converter but which, in case of subsequent electric refinement, is done in the Heroult bath. This done, one arrives at a surplus cost for the electro-steel over that of the Thomas steel of 7.50 to 10.50 mark per ton. This difference is in some localities smaller than the difference between Thomas steel and open-hearth steel.

By the acid process which has been developed for Heroult furnaces by Thallner the showing becomes considerably more favorable for the electric refinement, the surplus cost dropping to 3.75 to 6 mark per ton. This would make the electro-steel cheaper than open-hearth steel at one-half of the German works.

The materials which have been used for making acid electro-steel have not been particularly pure, the usual raw materials for Thomas converters having been employed. But as a result hereof the refined steel shows the rather high sulphur content of from .04 to .07, while by the basic process the sulphur goes down to .015. Director Eilender contends that the high sulphur content resulting from the Thallner method becomes immaterial by reason of the excellent structure of the product, and he would admit as high as .06 of sulphur for even the most select steels of acid production, but this view met with considerable opposition at his lecture on the basis of established views and experiences.—From *Zeitschrift V. D. I.*, June 7.



Defects in Springs

Part IV

Two Shock-Preventer Men Give Reasons Why They Consider Auxiliary Suspension Devices Necessary

HEREWITH are given the views of two men who are well known to the automobile world on the subject with which they are most closely acquainted. The subject of Defects in Springs, on which the automobile engineers, shock-absorber manufacturers, and engineers, spring men and automobilists with engineering inclinations have been carrying on a spirited discussion for some time in the Forum, was taken up by them after reading an article by G. H. Baillee in THE AUTOMOBILE for May 29.

Long Springs, a Sensitive Cushion and a Shock-Absorber—Flentje

CAMBRIDGE, MASS.—Editor THE AUTOMOBILE:—I fully agree with the lecture on Defects in Springs given by Mr. G. H. Baillee, as published in THE AUTOMOBILE for May 29, that the automobile springs and the sensitive riding of automobiles have been entirely neglected by most manufacturers.

There was a meeting of automobile engineers held 3 years ago at the Automobile Club of America on Fifty-fourth street, New York City, to which spring manufacturers, as well as shock-absorber manufacturers, were invited. At that time a prominent spring manufacturer stated that the friction shock-absorber was a detriment, in his estimation, to an automobile, for it took the resiliency out of the springs and stiffened the springs at all times. A prominent automobile engineer and a vice-president at the time, seconded and agreed fully with the spring manufacturer. At this time the friction shock absorber manufacturer stated that his friction shock-absorber held only 20 or 30 pounds.

When he finished talking I stated my experience, and what I considered necessary to create a good, flexible sensitive-riding automobile, and the following three points were absolutely necessary:

1. A high sensitive cushion.
2. A long soft flexible spring.
3. An automatic shock-absorber which positively does not stiffen the springs over good roads, but controls the spring action automatically.

On a five or seven-passenger touring car, if the spring was compressed violently to 4 or 5 inches downward, the spring would not have a recoil force of 30 pounds, but anywhere from 500 to 1,000 pounds, and what good would a friction device holding but 30 pounds do then? Since that time improvements in cushions have been made on some cars, as well as springs.

To explain in more detail why the three above mentioned points are absolutely necessary for comfort. A sensitive cushion is just as important as a flexible spring. In going slowly over little pot holes the main spring does not act quick enough, or compress sufficiently to take up the jolt, and the little jolt is taken up by a flexible cushion.

Secondly. The spring should be long, in my estimation, and of the highest grade of flexible steel, and when a car is loaded to its capacity, the spring at least should settle 1 inch or 1.5 inches, or, in other words, when one or two persons go in an automobile, the spring should show flexibility and sensitiveness.

The spring, if the car is equipped with the semi-elliptic type, ought to be 56 inches long, and when the car is loaded the spring ought to be almost straight to 1 inch or 1.5 inches when the car is loaded. The spring so constructed and of the metal stated, should make the car ride easily.

As to a car being equipped with the three-quarter elliptic type of spring. This construction at the present time on the majority of cars is absolutely defective, as the lower part which rests on the axle on most three-quarter-elliptic equipped cars is too short and the lower portion of the spring has too much curve. The top portion of the three-quarter elliptic spring in the majority of cars I have ridden in is absolutely of no value for sensitive riding, as this part is too short also. If they would do away with the top portion on the three-quarter elliptic, and put a solid piece of steel there, they would get the same results. If the three-quarter elliptic were constructed in the following way: have the lower spring 55 inches long with good long shackles and the top portion of the spring built proportionally, not too heavy, and the bottom spring built of the highest grade of flexible steel, as suggested in the first part for semi-elliptic, a car so equipped would ride "sensitive."

The construction of the elliptic spring on the majority of cars is very defective, for the same reasons as stated for the three-quarter elliptic, as the two side springs are too short. The spring in the rear of the car has so much curve to it on some cars, and is built of such thick stiff leaves that it would take on some cars 2 tons to compress them 105 inches, and, therefore, if a solid piece of steel were hung in place of such a spring as described, which are on many cars to-day, you would get the same results.

Shock-Absorber Is the Regulating Factor in Riding Qualities

In building springs of semi-elliptic, three-quarter and full elliptic, and correcting the defects, and having every spring constructed so it is sensitive, as described in the first part of my suggestions, and have a soft, flexible cushion, a car so equipped in going over good roads will ride perfectly and sensitive, but, on the other hand, if a car is equipped with fine cushions, and sensitive springs, as described, and goes at a fair rate of speed over rough roads, then a car like this will be more flappy, and and will sidesway, even if it was equipped with friction shock-absorbers, and more so than if the car had springs which were stiffer. If, however, the car that is sensitive, as described above, is equipped with an automatic shock-absorber, of a hydraulic type, which checks the downstroke, sidesway and recoil automatically from a pound to 1,000 pounds instantly, a car so equipped will ride perfectly and sensitive over the roughest roads. In fact, the faster the car travels the better the car will ride, as the spring is controlled entirely by a flexible liquid

cushion, and a car so equipped with a lighter and a sensitive spring of first class metal, the spring will stand more abuse and will wear longer without breaking than a stiff spring and of ordinary metal, as what breaks and wears the springs out is as follows:

If an automobile travels at, day 25 miles an hour or more and strikes a depression in the road, say 1 foot deep by 1.5 feet wide, first the front wheel will strike the hole, and then the rear one, and that instant the whole car cants over on this one spring instantly, and naturally there is twice the strain exerted than what it is originally designed for. Then the spring compresses that instant in the front, say about 2 to 2.5 inches, and in the rear it will compress 4 to 5 inches. The spring then comes back with a force, if there is a hole on one side of your car, of at least 800 pounds, if it is a big touring car and proportionally for a smaller car. This recoil brings the spring 3 inches or 4 inches beyond its normal shape upwards. Naturally the spring has a down-pulling force of at least 300 to 500 pounds, and then comes the weight of the body and passengers, and this over-straining force of the down stroke, and recoil, overstrains the spring and crystallizes it, as the spring accelerates up and down before it finally settles normal again. This overexertion wears the springs and crystallizes them, and they break.

On the other hand, if there was a flexible spring and a cushion on the car, as described before, and an automatic device attached, the severe downstroke instantly on this side is checked flexibly and automatically, and the preventer on the opposite side of the car would check the recoil, and in striking a hole, say at 25 or 40 miles an hour, as described above, the body would not move more than 2 inches, but if the car was not equipped with my device, the body would lean over, even if equipped with friction shock-absorbers, and as it has happened in many cases occupants have been thrown out of the car and the springs and axles have been broken.

I fully agree with Mr. Baillee that the spiral springs which are used on some cars are absolutely unnecessary, and are a detriment on the car. If a leaf or two was taken out of a stiff spring, and the springs lubricated, better results could be obtained than by using the spiral springs. If a person has an overstiff spring and the car rides like an ice-wagon, as a lot of them unfortunately do, then in that case a spiral spring will do such a car some good for slow driving, but if a car has a stiff spring, and the car is equipped with spiral springs, and the car travels rapidly at a good clip over rough roads, the spiral springs in this case are a detriment on the car, as it will simply counteract from the main spring and jingle the car up and down violently if the car is driven fast, but on the other hand the car could go faster if it had a stiff spring over the same roads and I am sure that it would ride better without the spiral springs.

Safety Point Ignored by Manufacturers in General

This safety point has been entirely ignored by automobile manufacturers in general, but it is very important to automobile owners. It has happened in many cases where an automobilist was driving over a rough piece of road at a good clip, and the tire exploded and the car started skidding and canted completely over. This has happened with cars equipped with friction shock-absorbers or dangerous axle straps. The instant the tire exploded it would settle down say 4 or 5 inches, according to the thickness of the tire. The spring on the opposite side would give the car a violent up-throw. At the time this violent up-throw would occur the leather strap would strike the axle and the violent jolt created would throw the car completely over.

On the other hand, if the car was equipped with an automatic device, the violent downstroke the instant the tire exploded would be checked automatically, and the preventer on the opposite side would check the violent recoil, and the car could travel 50 feet or more, which would give the operator a chance to slow down gradually and stop the car without feeling the least discomfort.

Many automobile manufacturers are blind, in my estimation, to the fact that automobile buyers, with ready cash, want automobiles to ride sensitive, as stated before, and the extra expense to produce a sensitive car would be very little. An A1 spring should be flexible and of good alloy, and by figuring the cost of a good A1 spring, and of a cheaper spring, which would weigh one-third heavier than the good spring, the cost would be very little. ERNEST FLENTJE.

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Pneumatic Type of Device Is Most Satisfactory—Cox

NEW YORK CITY—Editor of THE AUTOMOBILE:—The different articles appearing in your valuable magazine under the heading Defects in Springs are very interesting, especially to anyone who has been working on spring improvements.

Referring to the inability of the metal spring to supply the necessary support for variable loads, roads and conditions, I will state that, in my opinion, a condition is present which is beyond the ability of the metal spring to meet, even more so than when the conditions made necessary the use of the pneumatic tire for passenger motor-driven vehicles.

The writer is the inventor of a pneumatic cushion spring which has been in constant service for trial purposes nearly 2 years on one of the large Express Co.'s 3-ton trucks and during this time records show that a very satisfactory saving of the mechanism and tires has been made.

Several passenger cars have also been equipped with this pneumatic spring for the same purpose, and, in each instance entire satisfaction has resulted therefrom.

The merit of such a pneumatic spring and its ability to meet present needs is particularly evidenced when between 50 and 60 miles per hour can be made on solid tires of the cushion type with ample traction and comfort to passengers.

In order to provide for variable loads and conditions the writer has used a small air compressor geared to the motor, which forces the air into an auxiliary reservoir. By this means the pneumatic cushion spring system can be inflated or deflated as desired. All this is simple and inexpensive, but would give the desired result, i.e., provide the necessary support for the loaded or unloaded vehicle.

With this air spring system wide steel tires may be used on trucks having a capacity of 3 tons and up with ample motor protection and on country roads such tires are road builders, which is a factor to be considered. It might also be stated that a pneumatic spring which saves the tires, etc., must, of necessity, prolong the good condition of the roadbed.

The many attachments noticeable on the rear end of the rear springs of passenger cars evidences the desire for more resiliency and the different rebound checks on the market show the necessity for a spring needing no rebound check or shock-absorber, and which is adjustable to any load or road condition without the driver ever leaving his seat.

It should be evident to any authority on springs that checking the free action of the spring cannot but result in creating vibrations.

The numerous railroad accidents of late in a great measure have been charged to the inability of the rails to furnish the necessary stability, which is, no doubt, true, especially where great speed is maintained.

I venture to suggest that with more resilient springs the demand on the rails would be lessened and the prolongation of the life of the roadbed, rails and rolling stock would be increased in accordance with the difference in the resiliency of the present springs and a pneumatic cushion spring of the principle herein mentioned. In proof of this imagine the result if the present speed of railroad trains and motor-driven vehicles was attempted without springs.—P. H. Cox, president Cox's Pneumatic Cushion Co. of New York, Inc.

Among the New Books

Gas Turbines, British Cars, Scientific and Electrical Works Among Those Fresh From the Press

Toothed Gearing, Oxy-Acetylene Torch Practice and Materials Are Other Subjects

WIDE variety of topics distinguishes the books recently published which are of interest to the automobilist, the dealer, the engineer and the car manufacturer. Herewith are review works comprising an unusually wide range and all appealing to at least one of the classes mentioned. To the man who is interested in foreign cars and in foreign design The Autocar Handbook and British Motor Vehicles will be welcome. Other readers will find something which appeals to them among the other books mentioned:

THE GAS TURBINE, by Hans Holzwarth, translated by A. P. Chalkley, published by Charles Griffin & Co., Ltd., London, Eng. 140, 6 by 8-inch pages, with 142 illustrations and many tables. Cloth, $2.50.

Works on the gas turbine are scarce. This one devotes sixty-eight pages to the theory of the gas turbine, or, in other words, to a study of the thermo-dynamics of a gas engine employing this principle. Part II, consisting of the remainder of the book, is a study of what has been accomplished in a practical way with the turbine and with different fuels. For one who is studying the advance of the art of making a successful gas turbine in the larger units this work should be of great value.

BRITISH MOTOR VEHICLES, compiled by J. S. Critchley, M. I. A. E., published by Charles D. Clayton, Ltd., London, Eng. 152, 4 by 6-inch pages. Boards, 1 shilling.

This work should make a valuable guide for buyers of English cars. It gives the addresses of all the English makers and gives data regarding the dimensions of the motor and principal features of each car.

THE AUTOCAR HANDBOOK, compiled by *The Autocar*, published by Iliffe & Sons, London, Eng. 297, 5 by 8-inch pages, with reproductions from *The Autocar*. Cloth, 1 shilling, 9 pence.

As its name expresses, this work is a guide to the construction, upkeep and use of the automobile. The data of existing cars and accessories are very complete, while the methods of repair of different parts are also specific and clear. At the back of the book a dictionary of French and English terms for parts of the car is given. It is a handy book for the car owner.

WHO'S WHO IN SCIENCE, edited by H. H. Stephenson, published by J. & H. Churchill, London, 569 5.5 by 8.5-inch pages. Cloth, 8 shillings.

Giving a list of the noted men of the world in the important sciences, this work should prove a valuable reference book for those businesses or lines of endeavor that necessitate that they determine the status of individual scientists. The book is international in its scope and gives the address of each scientist together with the list of the books, contributions and discussions of which he is the author. It will be found quite complete in the sciences of agriculture, anatomy, astronomy, bacteriology, botany, chemistry, engineering, geography, geology, mineralogy, mathematics, medicine, physics, physiology, psychology and zoology.

NOTES ON THE MATERIALS OF MOTOR CAR CONSTRUCTION, by A. E. Berriman, M.I.A.E., Technical Editor of *The Auto*, published by St. Martins Publishing Co., London, 171 9 by 11-inch pages, with numerous halftone and line engravings. Cloth, 5 shillings.

The influence of heat treatment on metal is the most important subject under the consideration of the automobile engineer. On his knowledge of this phase of manufacture depends the life of the car he brings out. In this work the practice in the Daimler plant is illustrated and discussed from the heat treating furnace to the chemical laboratory. Micrographs of different metals show the effects on a section of the metal of the different heat treatments used in this great plant. For comparative purposes micrographs of metal in the rare and untreated state are placed next to others showing the make-up of the metal after the heat treatment. The great degree of grain refinement of such metals of chrome-vanadium after heat treatment is strikingly brought out in these micrographs. The effect on the steel of various alloys is completely discussed in the pages of this work as well as different methods of making tests in the Daimler plant. This work is something new in the automobile field and should be of the utmost value to the engineering staff of any factory or to anyone interested in automobile metallurgy.

TOOTHED GEARING, by George T. White, B.Sc., published by Scott, Greenwood & Son, London, 215 4 by 7-inch pages, with 135 figures in the text. D. Van Nostrand Co., New York City, distributors for America. Cloth, $1.25.

The object of this handbook is to make clear the action of the principal forms of teeth used in gear wheels. The two forms of tooth profile used in ordinary work, that is the cycloidal and the involute, are considered in detail. The cycloidal curve is explained as is also the involute at the end of the first chapter. The generation of the teeth and the calculation of velocity ratios at different angles, together with the relative inter-tooth pressure is shown in a clear and comprehensive manner for every type of tooth. The use of the odontograph for drawing standard tooth forms for pattern making, etc., is taken up in the last chapter of the work.

OXY-ACETYLENE TORCH PRACTICE, by J. F. Springer, published by the Richardson Press, 156 Leonard St., New York. 140, 4 by 7-inch pages, illustrated. Cloth, $2.50.

Prepared with the coöperation of the Davis-Bournonville Co., this work is full of up-to-the-minute information on oxy-acetylene welding. The use of oxygen with acetylene gives a working temperature of the flame tip of about 6,000 deg. Fahrenheit. This gives a tool with which hitherto impossible welding may be easily accomplished. This is especially true of work with aluminum, which, perhaps, is one of the most difficult to work at lower temperatures. Many cutting machines have been designed for use with an oxy-acetylene flame, most notable of which is the oxygraph. This device, together with the method of working different materials, is described at length in this work.

ELEMENTARY PRINCIPLES OF ELECTRICITY AND MAGNETISM, by Robert Harbison Hough, Ph.D., and Walter Martinus Boehm, Ph.D., published by the McMillan Co., New York, 233 4.5 by 7-inch pages, with 95 figures in the text. Cloth, $1.60.

This is essentially a book for advanced engineering students. In order to follow the work a knowledge of mathematics, including the calculus, is necessary. The strength and direction of magnetic currents are carefully studied and analyzed in that part of the book dealing on magnetism while in the latter part of the book the mathematics of applications or electric machines is studied. The measurement and calculation of magnetic, induction, potential and static units is brought home to the students by examples at the end of each chapter.

ELECTRICAL IGNITION FOR INTERNAL COMBUSTION ENGINES, by M. A. Codd, published by Spon & Chamberlain, New York, 161 4 by 7-inch pages, with 109 illustrations. Cloth, $1.25.

The earlier part of this work is devoted to an explanation of electric batteries, and the principles of the flow of electric current bringing out the meaning of the terms volt, ampere, ohm, etc. Following this, the principles of high tension ignition by means of coil, batteries and timer is explained and the remainder of the work is devoted to a study of ignition by high tension or low tension magneto and the methods of making magneto repairs.

Increasing the Efficiency of Trucks

What May Be Deduced From Exact Records and How Conclusions May Be Utilized—Average Figures Form the Basis of Improvements in Operation Which Reduce the Ton-Mile Cost

By Hans W. Weysz

TRUCK users have been advised again and again by the dealers who sell their freight automobiles to them, to keep full and exact records of the expenditures incurred by maintaining the vehicles in service. Some companies have gone as far as to design forms for keeping such costs, which are suitable for the majority of businesses in which trucks can be put to use. But, of course, forms must be different to permit of recording all essential conditions and facts occurring in the butcher, coal, contractor, grocery, laundry, flower businesses, to say nothing of such trades as department stores which use trucks for delivering the goods as rapidly as possible and which yet expect them to do this at the lowest possible figure.

However intricate a situation this be, there is today among truck users a fair and ever-growing percentage of individuals and corporations making use of cost-keeping systems. These serve to record the actual costs of operating and maintaining the vehicles and the work done by the latter for that expense, continuing such records for weeks, months and years, until they arrive at a huge mass of information from which representative and true average figures may be abstracted. But, this stage having been reached, the majority of users are at a loss what to do with the information they have on hand. So there are many who content themselves to complain of the high cost of their trucks or to be satisfied with a figure comparing favorably with horse or railroad delivery; but they forget that all information gained in this manner is valuable not only as history, but principally as the possible foundation for increased economy of operation and maintenance.

Truck salesmen have in many instances been so careless as to promise that the truck to be bought by a certain prospect would reduce the latter's delivery cost by a certain percentage. The figures named were generally based on experiences made with trucks operating under very favorable conditions and, in the majority of cases, in businesses different from that of the prospective buyer. Often enough the truck or trucks when sold could not realize the expectations founded on the promises of the salesman, and the consequent injury to the industry and trade makes it obvious that this class of salesmanship is one of the things most harmful to the truck business.

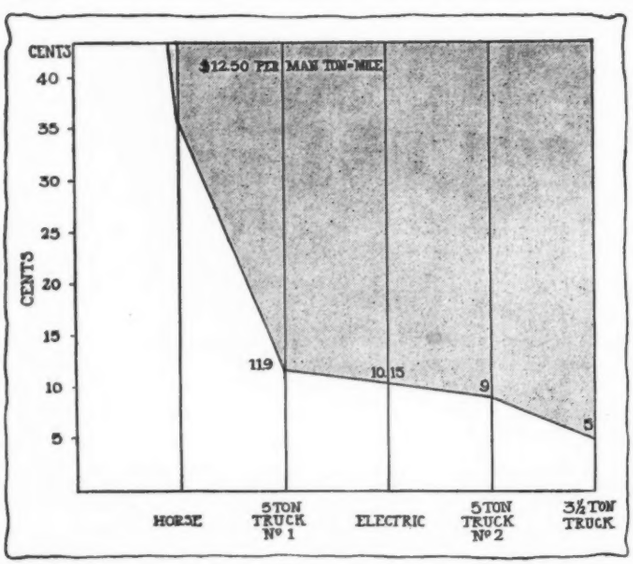


Chart 1—Ton-mile costs with various modes of transportation

The variable total cost for a given load carried over a given distance, or average cost per ton-mile, is dependable upon:

1. The size of the truck, or its capacity.
2. The degree of percentage of capacity to which it is loaded.
3. The time within which the load is transported.
4. The speed of transportation, following from No. 3.
5. The time spent in loading and unloading during a day, as well as the total time of traveling per day.
6. The amounts of fuel and lubricants used.
7. The expenses of repairs and additional equipment.
8. The fixed charges, including wages of driver and helper, interest on the investment, depreciation, insurance and garage expenditure.
9. The individuality of the driver, which influences Nos. 3, 4, 5 and 7, as well as the actual depreciation of the truck.
10. The conditions of the roads over which the truck travels.
11. Climatic influences upon which these conditions depend.
12. Geographical and topographical conditions.
13. Legislative conditions in the state or territory.
14. Ability of the truck superintendent.

These influences, which vary with trades, local conditions, prices of materials and labor, and abilities of individuals, account for the different ton-mile costs obtained by various truck users.

This diversity of ton-mile costs is illustrated by Chart 1, showing the figures for automobiles and average horse delivery, as well as an indication of ton-mile cost where human power is used for the transportation a load consisting of 100-pound bags. While in the last case the ton-mile cost would be $12.50, horse delivery reduces this figure to 36 cents. The next lowest figure is 11.9 cents, being the average result of 10 months' work with a well-known 5-ton truck. A lower figure was obtained with another truck of the same capacity, used by the same corporation and working under exactly the same conditions, excepting, of course, the driver's individuality which brought about a difference in the variable expenses and also in the work achieved with the trucks. The average ton-mile cost of a 1-ton electric ranges between the two, while a 3.5-ton truck is almost half as low as the more cheaply operating 5-ton truck, indicating that the conditions must be very favorable to compensate for the advantages which go with large capacity.

Reading of Average-Curve Charts

In Chart 1 the line connecting average ton-mile costs rises and falls with these, and the depth of the shaded space above it indicates the varying economy of the vehicles.

Charts 3 and 4 show the fluctuation in average cost per ton-mile of the two 5-ton trucks during the first 10 and 9 months of their respective operations. Both show a drop during the

summer months, considerably below the average cost line shown in dot-and-dash manner. But in addition, truck No. 2, which has the lower average, shows a second drop below this line in November, when the variable expenses were at a decided minimum, while the work done was above the monthly average, both as regards the load carried and the distance traveled. The dash line in Chart 4, indicating the average ton-mile cost of truck No. 1, is considerably above that of No. 2, and almost the entire curve showing the varying average of the latter lies below the average of truck No. 1 for the entire period. The drop in November, when roads were not at their best and conditions certainly less favorable than during the summer, proves the ability of the driver who handled truck No. 2. The showing of the latter is in every respect better than that of No. 1, both as regards miles traveled and tons carried per day.

Calculating the Truck Efficiency

Chart No. 2 compares average daily ton-mile totals and average costs of both trucks, the ton-miles being marked off as abscissæ and costs as ordinates. The rectangles formed by abscissæ, ordinates and the lines connecting them to the points indicating the specific figures for the two trucks give a clear picture of their comparative efficiency. No. 1 averages 117.7 ton-miles a day at an average cost of 11.9 cents, while No. 2 averages 134.7 ton-miles, the average cost being 9.1 cents. By dividing, in each case, the first by the second value, two quotients are found, namely, 9.89 for truck No. 1 and 14.7 for truck No. 2. These quotients may be fittingly referred to as the efficiency factors of the trucks. They are proof of the fact that, although the areas of the rectangles ABCD and AEFG are almost the same, their meanings and the practical values which they represent are very different.

But another very important angle is brought out by the same chart. The difference in ton-mile costs of the two trucks is 2.8 cents. On the basis of this fact as well as the other figures appearing in Chart 2, the following comparison may be made.

Truck No. 1, working 300 days in a year, renders 35,310 ton-miles of work. If its cost per ton-mile could be brought down to that of truck No. 2, $488.68 could be saved during 1 year. This would be an end worth striving after in any business, and it would be worth while to make every attempt to realize it. This may be done with the assistance of the driver, by causing him to make a special effort. Of course, it would be necessary to make this worth while for him, in other words, to give him a share in the saving obtained by his special effort.

Even if it is assumed that the average of 9.1 cents is exceptionally low and due to the driver's cleverness to such an extent as to be beyond the reach of the average driver—which is

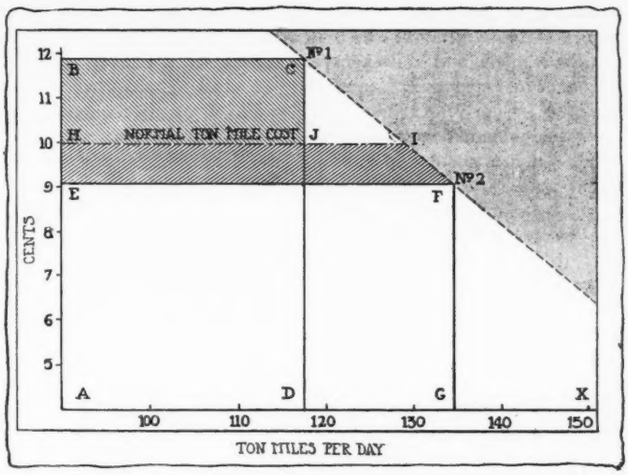


Chart 2—Comparison of ton-mile costs and work of two trucks

very improbable—the figure of 10 cents per ton-mile may be taken as a safe average which should be realized throughout the year as the work done by any truck operating under the same conditions as No. 2. In order, however, to get still better results, an arrangement may be made with the driver that he is to receive half of all savings obtained by depressing the ton-mile cost still lower than 10 cents. In other words, if he brings it down to 9 cents throughout the year the reduction would be $353.10, half of which would go to him as a bonus. With sufficient care this could be realized and perhaps even improved upon.

Of course, it is not always possible to get down to 5 cents per ton-mile, as in the case of the 3.5-ton truck mentioned in connection with Chart 1. This truck handles department store deliveries between a New York City store and suburban distributing depots. There is one loading point and a very few unloading points. Consequently little time is lost or spent except in actual travel, and this makes the truck very efficient.

Returning once more to the original enumeration of the factors which influence the cost of truck operation and maintenance, the following are within the possible reach of the driver, and may be improved upon by his efforts:

2. Loading. If the driver is properly instructed, he may easily superintend the loading of his truck. This work, of course, is no simple operation, as the truck should be neither overloaded nor underloaded, the first imposing an undue strain upon the motor and the rest of the mechanism, and the latter

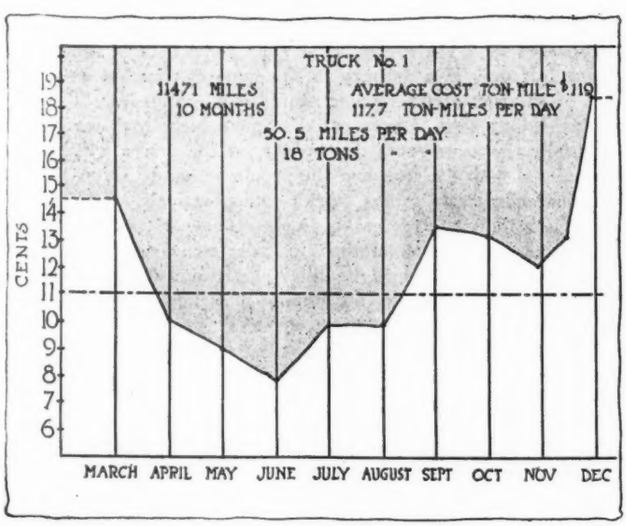


Chart 3—Ten months' fluctuations in a truck's ton-mile cost

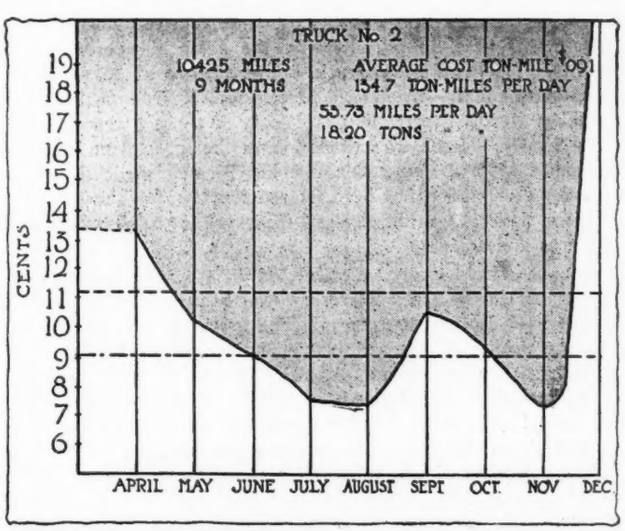


Chart 4—Fluctuations for twin truck working under same conditions

resulting in too great freedom of the springs, permitting their unobstructed vibration which is transmitted to the other parts of the vehicle and causes crystallization of the steel and disturbance of mechanical relations. If possible, the load should also be properly distributed, a certain fixed percentage being preferably loaded so as to weigh down on the rear axle unit, while only a smaller portion of the load should rest on the front axle.

3. The more a truck is enabled to do within a specified time, the greater is the number of ton-miles and the more are a number of fixed charges reduced with reference to the ton-mile. It is through a maximum of mileage that the value obtained from the driver's wage, garage, insurance and lost interest is increased and that these charges are reduced with regard to the ton-mile. As the latter must be taken once for all as the proper basic rating for the work done by a truck—except in very few businesses, such as furniture moving—everything tending to reduce the ton-mile expense should be done.

4. The speed of transportation follows directly out of the consideration of mileage covered in a given time, but it involves a phase very different from that just treated and, in fact, in a way directly opposed to it. While too slow traveling reduces the business value received from every gallon of gasoline and oil, from the investment in the truck and the current expenses accompanying its ownership, too great a speed must be guarded against as a cause of excessive depreciation. Consequently there is much dependent upon the good judgment and good will of the driver, and just as unintelligent or careless treatment of the truck may shorten its life by half, so may the converse lengthen it considerably.

5. By arranging the truck in an intelligent manner at loading and unloading places, by suitably directing the work and perhaps assisting in it, the driver can do a lot to save time and thereby reduce a factor which threatens to cut down the profitability of each and every truck—waste time.

6. If the driver treats his truck with consideration, adjusts and lubricates parts well and corrects all troubles in their incipiency, the amounts of fuel and lubricants required by the motor are minima for a fixed quantity of work done by the vehicle. If, however, parts are once underlubricated they will call for more liberal and therefore more expensive lubrication afterward and be in need of repair sooner than if they had been properly cared for from the beginning on.

7. A good part of all repairs is due and proportionate to the treatment or, rather, maltreatment of the truck receives from its driver. This is true not only of small repairs, but also of larger and even a percentage of accidents which would probably be avoided by a sufficient degree of care. The influence of the personal equation on this factor is astonishing.

Thus almost half of the factors are influenced by the behavior of the driver and this fact makes it advisable to get the man on the seat to do absolutely his best for the truck. There is not a man driving a truck in America or anywhere else but would do everything in his power to reduce the operating and maintenance expenses to the utmost if he is given a fair share in the saving thereby obtained.

Points 1, 10, 11 and 12 are not under the control of the truck owner or any of his employees, but 13 is, and for this reason that every business man should do his utmost to bring about sensible legislation with regard to motor trucks, both as to good roads in his territory and as to licensing and taxation actions taken on the part of his state.

Finally, the ability of the superintendent has to be considered. He should have considerable experience not only with mechanical apparatus and trucks, but should also be thoroughly familiar with the specific business in which his trucks are used, so that he knows what they carry, what the requirements as to speed are and toward what point improvements should be directed. It is also up to the superintendent to watch over the drivers, see that they are doing their best and induce them to drive the truck rightly and care for them properly. A good superintendent is able to balance the ill effects of half a dozen very mediocre drivers, and for this single reason it is desirable to have a man to do this work if there are more than two trucks used. It should not be forgotten that the superintendent can do a great deal to improve delivery conditions of a business, provided he has brains and backbone, and that the business of a company may be materially increased because of such improvements.

Depreciation Is a Variable Quantity

Depreciation of a truck should be charged under variable expenses. Usually this item is put down on a basis of time, that is, for every year of service the intrinsic value of a truck is considered to be reduced by a certain percentage, from 25 to 33 per cent. The Locomobile company, however, is of the opinion, and justly so, that it is not the length of time that a truck stays in the hands of the customer, but the work it does during this time, in other words, the mileage covered during its life. Taking a $5,000 truck, a life mileage of 100,000 miles is probably conservative, and depreciation is figured on this basis. In other words, depreciation is calculated to be 5 cents a mile, theoretically. If the truck lives longer the investment has been redeemed after the 100,000th mile has been finished; if it lives less the depreciation has been figured too low and the depreciation for the mileage not covered—short of 100,000—must be put down as a clean loss.

Interest should really be calculated on a similar basis, as the investment in the truck decreases exactly in the same measure as the total depreciation grows. The greater the past depreciation the smaller the intrinsic value of the truck and its property of being a live investment. As value is annihilated by depreciation, investment is redeemed. Interest should therefore always be figured on a basis of "First cost less depreciation until the moment," but this being too intricate a calculation the average between $5,000 and nil—value after 100 per cent. depreciation—is taken as a basis, namely $2,500, 5 per cent. of which is $125 a year. This value appears in the calculations of the Locomobile company for truck rentability submitted to prospective owners.

Routes for Delivery by Motor Trucks

In such work as department store deliveries, the performance of each truck forming part of the system must be well organized and laid out in advance, in order to make its operation as nearly automatic as possible. It is considered good practice to divide a territory—consisting of a city, county or state—into a number of districts through which truck routes are laid. Each truck operating in the service of the firm is assigned one route which is covered by it every day in the year and which is adhered to, being left only if a delivery in the same district but somewhat out of the way of the regular route has to be made.

But, in any case, it is essential to have each truck travel substantially the same route day by day, as the driver will become acquainted with the road and the people he has to serve, thereby enabling him to do things quickly and effectively. This system of delivery is much preferable to the scheme of shifting drivers from one route on to another, in order to acquaint them with a larger territory. While the latter plan makes it possible to use any driver on any route, the general efficiency of the system is less than with the first plan in effect.

The adoption of a route division of a certain territory does, however, not mean that an arrangement once made is to be rigid and to continue without modification. Rather, the delivery superintendent should cover each route with a truck at least once in 2 months, so as to become aware of changes of road conditions and other circumstances which make a change of the routes advisible. Only by keeping in contact with the situation in the road field and by adopting the route layout to the varying state of the former, the delivery system can be kept at the top notch.

Making Repairs on Inner Tubes

TUBE repairs are of two kinds, temporary and permanent. Permanent repairs can be made on cuts of any size, but temporary repairs are never made on any but the smaller cuts and punctures. In considering the smaller cuts, therefore, we must take into consideration the proper method of making a temporary and permanent repair.

When the sudden bumping along the road announces to the alert driver that one of his tires has "gone flat" he immediately throws out the clutch and applies the brakes. He knows that 50 yards of traveling on a deflated tire may mean the end of the career of both the shoe and the tube on account of the deadly rim-cutting. This stopping of the car immediately is really the first step in the work of repair, because every foot of unnecessary travel on the deflated tire means just that much more terrific strain and distortion on the tire and a serious augmentation of the damage already done.

Sometimes Patching Is Necessary

When the tire casings are in good condition the chances of a blowout are much smaller than when they are old, and when the flat tire occurs it will probably be in the nature of a puncture. Should there be no extra tubes along the problem will be one of making a roadside tube repair, generally a patching job.

The tube is removed from the tire and the location of the leak found. This will be possible by pumping some air into the tube and either finding the leak by listening for the hiss of the escaping air, or, if it is very small, by dipping the tire in water and watching for bubbles at the point where the air is finding its way through.

When the leak is found the remaining air should be removed from the tire. If it is a very small leak the valve will have to be screwed out by inverting the valve cap and using it as a screwdriver, or if it is a large leak the air can be squeezed through the hole. The tube is exhausted of air by rolling it up toward the opening used for the passage of the air, whether it be the valve or the leak itself.

After the air is entirely exhausted spread the tire out flat with the leak up. There are two kinds of patch that can be used, either the kind that does not require cement or the kind that does. The cement patches are harder to put on but last longer. The tube is prepared in the same way with either patch. With a small piece of emery or sandpaper the tube is roughened around the cut and then it is thoroughly cleaned with gasoline. The cement patch is prepared in the same way, first being rubbed with the emery and then cleaned with gasoline. An application of tire cement is made to the tube and the casing and allowed to dry. Another coating of cement is added to the part to be mended and the patch and these are allowed to dry again. A third coat is then put on and when nearly dry the patch is pressed firmly on the tube, which will be very sticky.

The tube should not be used for about 10 minutes after the patch has been put on, and during this time a weight should be placed on the patch to hold it firmly in place. A little tire talc will prevent the tube from sticking to the casing after the repair.

With the no-cement patch the method of procedure is the same except that instead of applying cement to the tube and the patch, the tube is cleaned with gasoline and the patch dipped in gasoline and applied to the cut.

It is not safe to use patches for larger holes as the pressure upon them is then so great that they do not last very long.

There are now on the market vulcanizers which are so small that many car owners carry them on the road and make their repairs permanent instead of having the always uncertain patch which may outlast the tube or may last only a short time. These portable vulcanizers are very easily operated, the exact method depending upon the type that is used, whether gasoline, steam or electric. The two latter types are for garage use, while the former is the type that is carried on the road.

When using one of these vulcanizers the tube is prepared the same as if for patching except that instead of using the regular cement and patch, vulcanizing cement and pure Para rubber are used.

It takes 15 minutes to vulcanize a tube. During this time the temperature of the vulcanizer should be 265 degrees and should not vary 5 degrees to either side of this amount.

When the tube has been cleaned some raw Para rubber is cut to the size to fit the hole in the tire. After the hole has been carefully fitted a larger piece of rubber is cut to fit over the hole and at least 1-8 inch all around its circumference. The latter piece of rubber is laid over the smaller piece which has been placed in the hole in the tube and the vulcanizer clamped down upon it. The tube is then ready to have the heat applied. The method of doing this will depend upon the type of vulcanizer that is being used. With the electric type it is only necessary to turn on the switch. With the steam type the water is supplied also and with the plain alcohol or gasoline type the fuel is placed in the receptacle and ignited. In the latter type of vulcanizer the heat used is taken from the fuel. After the vulcanizing process is complete the vulcanizer is removed and talc dusted over the point at which the repair was made. It can then be placed in the casing and used.

Long tears and big blowouts in tubes are always repaired by vulcanizing. If they are very big it is customary to cut out a section of the tire and put in a new piece. These new pieces can be cut from old tubes and it is a good thing for that reason to save old tubes against a time when it is necessary to do some work of this nature.

In splicing the two ends of a tube together two mandrels are used. These are simply two thin tubes, one whose inside diameter is the same as that of the tire and the other whose inside diameter is just large enough to slip over the smaller tube. The tubes are pulled through and turned back over the mandrels. The turned-back part is 4 inches long on the larger tube and 8 inches long on the smaller. Four inches of the turned-back portion on the smaller tube is again turned back giving a double fold. The folds are coated with an acid-curing solution and the 4-inch fold turned back over the doubled 8-inch fold. The joint thus formed is wrapped tightly and in 20 minutes will be well knit. At the end of that time the tube can be removed through the split sides of the mandrels.

Value of Full Tire Inflation

Many tire experts agree that more than half of the number of tire troubles are due directly or indirectly to underinflation. As it is, in the case of the pneumatic tire, not the rubber but the air which carries, suspends and cushions the weight of the vehicle, everything, of course, depends on having as much air as possible in the tire tube, without approaching the breaking point of the rubber at the weakest place of the tube. Every molecule of air which can be safely held in place in the tube helps to do the work for which the tire is employed. Incidentally, it keeps tube and casing in the most desirable form, for which they are designed, and holding them rigidly, offers stones, nails and other road sundries such resistance as is needed to make the impact harmless.

The Rostrum

In which Letters from Readers Are Answered and Discussed

Opinions on Gearbox Location Submitted—Believes in Three-Point Spring Suspension on the Front of the Car As Well As the Rear—Timing an Elmore Two-Cycle Motor—Kerosene Through Intake

Unit Gearbox Hard to Keep in Proper Alignment with Motor

EDITOR THE AUTOMOBILE:—Several days ago the writer wrote you an opinion in regard to the location of the gearbox from an owner and repairman's standpoint. Since that time I have had an opportunity to observe several motor unit transmissions in the repair shop very closely. In addition to the extreme inaccessibility of the clutch and the transmission itself, it is a fact that when these transmissions become old or worn the alignment with the motor is spoiled and they become very noisy. In fact, it seems almost impossible if these transmissions are once torn down ever to build them up again so that the alignment is perfect and the transmission quiet running. On the face of it this seems unreasonable, but, nevertheless, is a repair shop fact. The motor transmission unit is generally so long that the body distortions are extremely severe on the entire assembly. This is bad enough on the motor alone, but here is unavoidable, but when the gearcase is added to the assembly it becomes much worse, causing the various bearings in both motor and transmission to bind at times and wear with great rapidity, making a very noisy and short-lived assembly. While from a manufacturing standpoint this construction may be very inviting, I would, nevertheless, deem it the very worst location for the transmission.

The ideal construction to my mind is to have the motor set a little farther forward than is the general practice, having the flywheel come directly under the dash, leaving a space of at least 1 foot between the clutch and the amidship four-speed gearset, and have the clutch so designed that the entire clutch be immediately accesible and so it could be entirely removed in ten minutes. Also have the amidship transmission located directly under the floorboards with one large top cover plate giving access to every part of it. The rear axle should be floating and inclosed in a one-piece light pressed steel housing with a large round cover plate in the center over the differential. This undoubtedly is the most accessible, the longest lived and the most fool-proof arrangement and one that will keep repair bills down.

In discussing gearsets, it seems to me very peculiar that the four-speed gearset is being taken hold of so slowly, and that it is found only on high-powered cars. The light, low-horsepowered motors certainly need the relief afforded by a fourspeed gearset more than those of from 50 to 60 horsepower. There certainly is a demand among buyers for high-grade light cars with four-speed gearsets, and I predict a big sale for any factory that puts out a strictly high-grade gentleman's light six cylinder car. By light six, I mean one of 3 to 3.5-inch bore and 5 to 6-inch stroke, having a horsepower of from 25 to 35 horsepower, weighing from 2,000 to 2,500 pounds and having a four-speed gearset.

St. Louis, Mo. C. V. B.

¶ *In answering this question car owners are directed to the fact that one of the leading arguments advanced against rear axle location is that of increased axle weight and consequent tire damage. Definite information on this line would be in order.*

¶ *Those not in favor of the amidship location have urged against it lack of accessibility.*

¶ *The gearbox as a unit with the motor has been criticised in that it is not suitable for a heavyweight car because of the fact that too much weight is placed in front.*

Likes Three-Point Suspension

Editor THE AUTOMOBILE:—I see from your paper that you desire some discussion in regard to the spring suspension of cars. It seems to the writer that the front springs in nearly all cars are deficient. In the front is carried the engine and most vital parts, yet the springs are such that the jolts and vibration are much worse at the extreme front of the chassis. The front of a loaded automobile is always by far the lightest, yet the front springs are generally short, stiff, semi-elliptic, which transmit all kinds of road shocks to the frame and cause heavy distortions to the frame and engine. Of course the semi-elliptic front spring in front is hard to get away from, but they certainly should be much longer and I believe should hang under the axle instead of over it.

I believe that an improvement in the spring suspension in the front could be effected by having a platform spring underneath the car, the cross spring being much the heaviest and fastened to the center of the cross member that holds the rear of the motor. In order to carry this idea out it would be necessary to have a very long bearing at the rear of the motor and to have a straight cross member of the frame go under it between the flywheel and the crankcase, fastening the platform spring to the cross member of the frame directly in the center and under the rear end motor bearing. This would be necessary in order to prevent the cross spring from being too low. The beauty of this suspension is that you would have a three-point spring suspension with the single point of suspension in the rear. Then if you had a three-point suspension motor with the single point of suspension in the front it would practically relieve the motor of all strains and distortions. The frame distortion would be all in front, where it would make no difference, as the single point of suspension of the motor would be in front. And in the rear where the motor is fastened to the cross member of the frame in two places there would be no frame distortion, as the spring would only be fastened to the frame at one point here and the frame distortion from the front shackle of the springs would practicaly amount to nothing this far back. This idea is shown in Figs. 1 and 2.

In regard to rear springs, I think that most all could be made

longer with good effect and slung underneath the axles. One of the easiest riding machines I was ever in was an Atlas taxicab which has springs one and one-half as long as the ordinary. These cabs get very rough handling and certainly stand up. I prefer three-quarter elliptic springs in the rear.

If more attention were given the springs the life of both the whole car and tires would be considerably lengthened, not to mention the increased comfort and pleasure to the owner.

St. Louis, Mo. C. V. B.

Atwater Kent System on Elmore

Editor THE AUTOMOBILE:—Will you please give me the proper position of the crankshaft at full retard and full advance of spark on Elmore four-cylinder two-cycle model 25 touring car? It is run on dry batteries with Atwater-Kent spark generator.

2—How many batteries that test from 20 to 25 amperes can I use with this system without damaging it? I see the directions on it calls for six or eight dry cells but do not say what amperage.

I have just overhauled my motor and cannot get it timed right. I would like to use it as soon as possible.

3—Does the explosion take place at the same time the spark

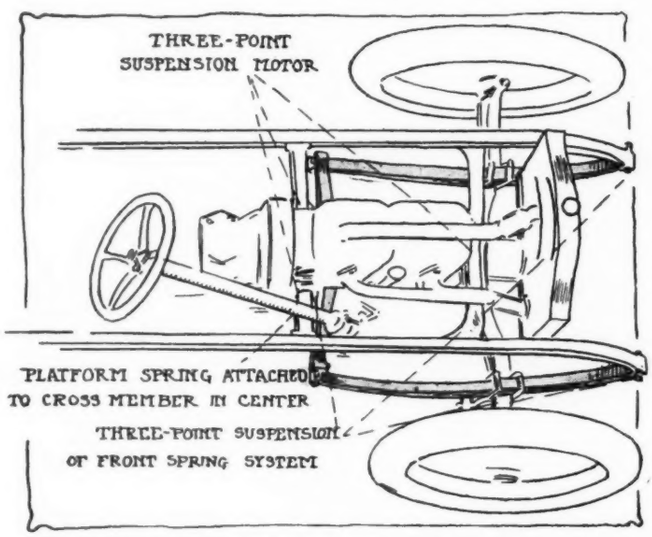


Fig. 1—How the three-point spring suspension could be applied

is made in the generator or does the piston travel some distance before the explosion occurs?

Metz, W. Va. L. C. S.

—1—The crank should be turned so that the click of the points as they separate in the Atwater-Kent instrument is heard just as the crank is at upper dead center on full retard. On maximum advance the crank should be advanced between 36 and 37 degrees. As explained recently in The Rostrum, it is hardly ever necessary to put the full retard back of upper dead center because there is always an appreciable time between the spark and the full explosion of the gas. Therefore, even with the spark occurring exactly at the dead center, the impulse due to the explosion is a little later than dead center and no knock can result.

2—You can use as many cells testing 20 amperes as you desire, provided that you do not let your voltage run up over 6.5. The amperages drawn by the ignition systems are very small and it takes a long time for a set of dry cells to be exhausted. If you use five cells of a well-known make and connect them in series your service will be satisfactory. If you do not use a magneto at all use twelve battery cells connected in series multiple. Twelve batteries connected in series multiple would consist of three sets of four cells. Each of these sets is connected in series, that is, the carbon of one battery is connected to the zinc of the other. When the four sets are connected up in this way rigidly, there will be a carbon on one end and a zinc at the other which are not connected on each set. Connect all the zincs to each other and then all the carbons, using the connecting wire in each case as the negative and positive poles respectively of the battery set.

3—This question is answered under 1.

Uses Kerosene Through Intake Pipe

Editor THE AUTOMOBILE:—I have been giving my two-cycle Amplex a generous supply of kerosene through the carbureter, after about every 200 miles, to decompose any carbon deposit and free the piston rings. I have practically no trouble with carbon and immediately after this internal bath, the motor has noticeably more "ginger."

Is there any danger of my injuring the pistons and cylinder walls on account of the kerosene cutting the oil, as I use about 1 gallon kerosene, run the motor at approximately 500 revolutions per minute and the operation lasts about 20 minutes?

Bradford, Pa. G. FOLCONBRIDGE.

—When putting the kerosene through the carbureter in this manner there is not much danger of its getting into the lubricating oil unless you put it in and in exceptionally heavy doses. For safety's sake it would be a good idea to add some lubricating oil to the regular supply after you have finished running the kerosene through.

Wants Information on R. C. H. Car

Editor THE AUTOMOBILE:—I have an R. C. H. machine which I have driven 2,000 miles without a sign of valve trouble. Once a week I pour kerosene oil into the cylinders while still warm, and allow it stand over night. Will this method have an injurious effect on the cylinders? Also, should the motor be cleaned at regular stated intervals, such as after every so many miles, or should it be allowed to show signs of losing power before it is cleaned?

2—Will fast driving injure the motor, providing the road is smooth?

3—What will prevent rust on the tire rims?

4—Will you lay out for me the shortest distance between Grand Rapids and Lakawaxen, Pa., which is situated near Port Jervis on the Erie Railroad, paying particular attention to the condition of the roads, and including any points of interest that would not require too great a detour. Also from Lakawaxen to New York and back to Grand Rapids by a different route. Kindly give me the distance to be traveled in road miles. Also any hints or suggestions that the experience of others has shown will make for greater comfort and at the same time tend to make this trip as economical as possible, will be greatly appreciated.

5—Is there any law against camping by the roadside? It is my intention to take a tent along and camp wherever night overtakes me.

Grand Rapids, Mich. J. REBOURS.

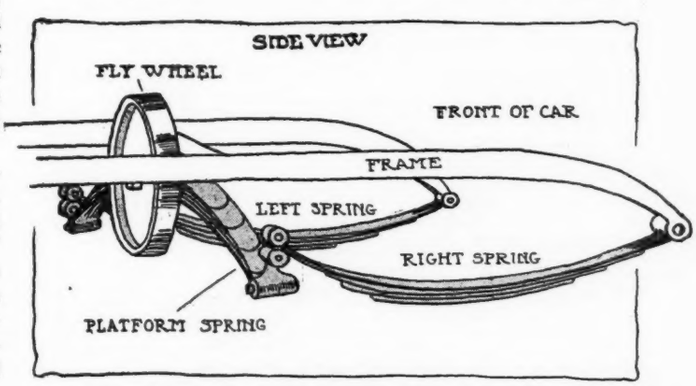


Fig. 2—Mounting of the platform spring below the engine subframe

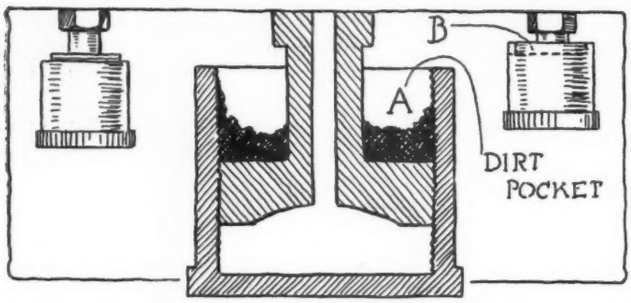


Fig. 3—How a dirt pocket is formed by screwing up the grease cup too far

—1—By using the method you suggest the motor should not need cleaning more than once a season. The only thing to guard against when using kerosene in the cylinders is the cutting of the lubricating oil away from the bearings. The action of kerosene on lubricating oil is almost as severe as that of gasoline. When the cylinders are hot, however, if you do not use more than a compression cupful of kerosene this will be evaporated so rapidly that it will not have a chance to get at the bearings. This small amount of kerosene is all that is necessary to keep the rings free. If you are driving with your carbureter adjusted for the right mixture, that is, all the air that the motor can stand without exhibiting signs of weakness in the way of a slow pick-up or acceleration and misfiring, your carbon troubles will be minimized. Another great point in the way of saving yourself trouble in the way of carbon deposits is to buy the best lubricating oil obtainable. Where you have a choice of two grades of the same manufacture choose the more expensive, because the extra work in the preparation of this oil means labor and expense saved to you in keeping the motor in condition. If you have your valves ground once a season, this will be sufficient. Most people make one job of grinding the valves and cleaning out the cylinders. Leaky valves are always detected by the peculiar action of the motor when traveling at a low rate of speed not under a heavy load. On a small throttle opening the motor will run on two or three cylinders and the fourth will not come into action until the throttle is opened up. When this occurs it is time to have the valves looked after.

2—A motor that is driven at high speed will not have the same length of life as a motor that is driven at low or moderate speeds. The life of a motor depends on its bearing surfaces. These are the only parts that wear. It stands to reason that two surfaces which are rubbed together will wear away quicker if the rubbing action is more rapid than if it were slow. No direct injury is apt to be rendered to your motor by driving it at a high rate of speed unless you go at it with the intention of reducing all present speed records. The most carefully constructed racing cars have suffered broken crankshafts, etc., under those circumstances.

3—About the best preventive for rust on tire rims is a coat of graphite paint. Many people use graphite powder instead of talc when putting the tubes into the casings, and this is very good because it can be also sprinkled between the shoe and the rim and will not only prevent rust wherever it is in contact with the metal but it will also prevent any possibility of the sticking of the tire to the tube or to the rim. A light coat of any kind of paint that will not soften under the influence of heat will also act as a rust preventative.

The biggest increase in expense that you will be called upon to sustain in traveling at high speed even on the smoothest of roads is that of tire wear. The life of a tire that is run constantly at 35 miles an hour is about one-tenth the life of a tire that travels over the ground at the more moderate rate of 15 miles an hour. Therefore by traveling around 30 or more miles an hour you can count on at least tripling your monthly tire bills. It all comes down to the proposition of whether the enjoyment you derive from fast traveling is, in your opinion, worth from 3 to 10 cents per mile added to your maintenance cost. Another factor in the matter is what you mean by fast traveling. Anything up to 25 miles an hour is reasonable on smooth roads when the weather is not exceptionally hot and hard on the tires. Above that speed your cost curve bends sharply upwards.

4—The shortest route, traveling all the way by automobile, is as follows:

From	To	Road condition	Mileage
Grand Rapids	Lansing	Generally good gravel	66.1
Lansing	Toledo via Tecumseh	Gravel and dirt, some sand	107.7
Toledo	Cleveland via Fremont	Macadam and gravel; roads worn	121.0
Cleveland	Erie	Good gravel and stone	101.0
Erie	Warren	Fair to good dirt	67.1
Warren	Wellsboro	Fair dirt	127.3
Wellsboro	Towanda	Fair dirt	53.9
Towanda	Scranton	Fair dirt	69.6
Scranton	Milford	Good macadam to bad stone	56.3
Milford	Lackawaxen	Country Dirt road	25.0
Total mileage			795.0

Suggested return trip via New York City:

From	To	Road condition	Mileage
Lackawaxen	Milford	Fair dirt	25.0
Milford	New York via Newton and Dover	Nearly all macadam	80.0
New York	Delaware Water Gap	Nearly all macadam	84.9
Delaware Water Gap	Wilkes-Barre	Nearly all macadam	56.1
Wilkes-Barre	Eagles Mere	Fair to good dirt	57.7
Eagles Mere	Williamsport	Good in dry weather; weather; very hilly	36.3
Williamsport	Port Matilda	Macadam and old stone	73.9
Port Matilda	Franklin	Macadam and dirt	134.6
Franklin	Mercer	Dirt and stone	30.1
Mercer	Sharon	Fair dirt	16.5
Sharon	Youngstown	Poor dirt	15.3
Youngstown	Cleveland	Poor to fair dirt	66.3
Cleveland	Toledo	Worn gravel and macadam	121.0
Toledo	Lansing	Dirt and gravel	107.7
Lansing	Grand Rapids	Fair gravel	66.1
Total return mileage			971.5
Outgoing mileage			795.0
Total miles			1,766.5

These routes are covered thoroughly in Blue Books 3 and 4.

5—Through most of the country through which you travel it will be perfectly feasible for you to camp near the road. The routes as outlined above will take you through some interesting and historic country and through beautiful scenery. This is especially true of the side trip to Eagles Mere.

Fitting a New Piston Bearing

Editor THE AUTOMOBILE:—Would you kindly tell me the right way to fit a piston bearing after it is burned out? Must it fit tight to the shaft or must it turn easy without any play? I mean after it has been rebabbited and scraped into shape. Does the same rule apply to main bearings? ED. BROWN.

New York City.

In replacing the bearing on a burned-out piston pin there should not be the slightest perceptible play. Any play in the bearing will result in a knock which will be easily heard even though the play amounts to only a few thousandths. The bearings should fit so closely that any space existing is taken up by the filling of lubricating oil. The tightness of the bearing which will be noticeable at first after the babbitt has been scraped in will soon disappear when the lubricant works its way in and the motor has been working for some time. The same rule applies to main bearings.

Rubber Tires as Lightning Conductor

Editor THE AUTOMOBILE:—What protection, if any, do the tires of an automobile afford the car and its passengers during a nearby severe electric storm? Would it not be a relatively safe place? H. E. FERNALD.

Pittsburg, Pa.

There is no reason to believe that any protection is afforded against lightning by the rubber tires on the ground. If a bolt of lightning is headed for the car the rubber tires will never stop it. As far as rubber tires being an electric conductor is concerned, if you will stand on the ground and touch the ungrounded magneto electrode, the shock you will receive will

readily convince you that the current from the magneto has no difficulty in passing from the frame of the car to the ground through tires and then through your body and back to the framework again.

Denatured Alcohol Blown from Cylinder

Editor THE AUTOMOBILE:—While injecting denatured alcohol through the petcocks into the cylinders of my motor I noticed that the liquid would enter readily into the first three cylinders, but as to the fourth (last) cylinder the alcohol sputtered out as fast as I injected it, although the petcock had been open for some time. It acted just as if compressed air were forcing the alcohol out. It blew it for a distance of 3 feet at least. What is the cause of this?

Does it denote anything out of order, and if so what is the remedy? I. BACHMAN.

Brooklyn, N. Y.

—The probable explanation of this mystery is that you had some glowing carbon deposit on the top of the piston. When you poured the alcohol on the carbon it was vaporized and possibly even ignited to a small extent. This would result in the blowing out of the liquid in the manner you describe. If this is the trouble the cure is the removal of the carbon either by using kerosene, denatured alcohol, one of the prepared carbon removers or by a manual scraping job.

Installing Worm Gear on Old Car

Editor THE AUTOMOBILE:—Is there anyone making worm gear drive that could be put on the average old car?

Hasbrouck Heights, N. Y. F. W. H.

—The expense connected with this work would hardly justify it as an entire new rear axle would have to be purchased. The shape of the worm drive is such that it could not be housed in the differential casing, so that in order to put the worm on the only possible way would be to buy a new worm-drive axle and assemble it to the rest of the chassis; even then some special work would have to be done to make the axle fit the dimensions of the old car. While the work can be done it is not advisable.

Bad Alignment Causes Tire Wear

Editor THE AUTOMOBILE:—When both front wheels are out of alignment with rear wheels, will one front tire wear more quickly than the other? We have had much difference of opinion on the subject, and would like your opinion.

East Liverpool, O. THE STANDARD GARAGE CO.

—In order to consider problems of alignment it is necessary to have a reference line or plane from which the alignment of the part studied must be judged. This reference line in the case of an automobile is the center line of the car itself drawn in the plane determined by the points of contact of the wheels and the ground. It is geometrical fact that a plane is determined by three points, but for practical consideration it may be assumed that all four points of contact of the wheels and the ground are in the same plane. The center line will pass through the middle of the front and rear axles. Upon traveling in a straight line the direction of travel of each wheel must be parallel to this line. Any tire which is not traveling parallel to this line has two forms of contact with the ground, a sliding and a rolling. When the line of travel is parallel to the center line the contact with the ground is merely a rolling one. The sliding contact of the tire and the ground is what does the damage. The amount of sliding is governed by the divergence of the line of travel of the wheel to the line of travel or center line of the car, the line of travel and the center line being coincident. Therefore, if the two wheels are both out of alignment that having the greatest angle of divergence with the line of travel will have the greatest tire wear. If they have the same angle they will wear the same. A practical consideration which is sure to be felt is that the steering of the car will be harder if one wheel is more out of alignment than the other because, with a reversible steering gear it will be a continual pull against the driver's hands, as the front wheels are pushed by the friction between the misaligned wheels and the ground. It is possible to test whether one wheel is out of alignment or possibly if one is out of alignment more than the other, with a reversible or semi-reversible steering gear, by traveling along the center of a good road with the hands off the steering wheel. If there is a marked tendency for the car to veer continually to the same side of the road the wheels have different degrees of alignment.

Grease Cup Choked with Dirt

Editor THE AUTOMOBILE:—The grease cups on my car are accessible but there is one point in which I think the designers were short-sighted and, since I have seen the same thing on cars of other makes, I believe it is a common fault which should be rectified. When a grease cup is turned upside down it can be screwed up far enough to form a perfect cup for the reception of dirt and grit. Referring to Fig. 3, it will be seen that when the cover of the grease cup is turned up past the body of the cup the dirt will fall into the part B, or that shown in section at A. When the cup is turned up the dirt is worked into the threads and the result is generally a jammed cup.

Another point which applies to commercial cars upon which I believe designers have been lax is the application of a sprag or positive emergency brake which will prevent the car from rolling down a hill and overturning at the bottom. There have been many instances where this very thing has happened either because the brakes failed to work or because the wheels skidded. There are two forms of sprag which could well be fitted and upon which the driver could rely in case of emergency. These are both shown in Fig. 4. The regular sprag is simply a beam which props the car in place when it tends to go backwards The other type is a pawl which acts upon ratchet teeth cut in the driving sprocket or in fact any other rotating part. With either of these sprags the driver has to be competent enough to know when to use them, for if he drops them after the car has gained a considerable degree of backward momentum he can do much damage to the car.

Battle Creek, Mich. GRUMBLER.

Please Sign Your Inquiries

The Editor of the Rostrum is in receipt of several letters which offer no clue to the identity of the sender because they are signed Subscriber, Reader, by initials or noms de plume. These letters are held and will be published as soon as the senders identify them. If your letter is among these you can have it published by writing this office describing the letter.

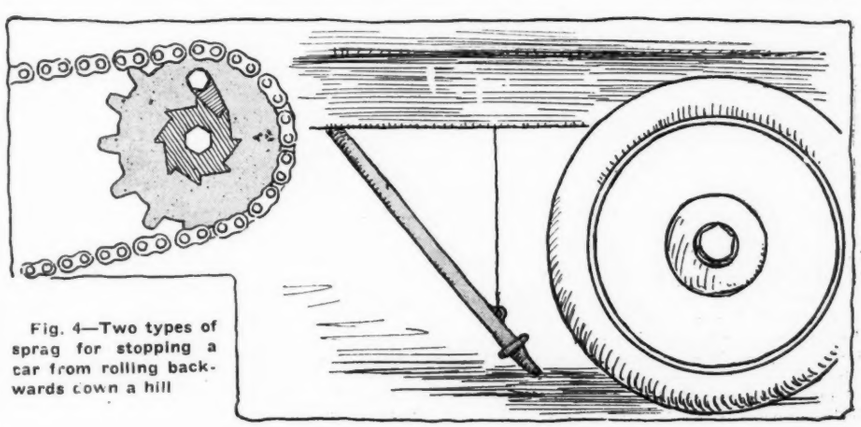


Fig. 4—Two types of sprag for stopping a car from rolling backwards down a hill

Lubricating Oil

New Methods of Testing for Engine Oil Specifications Advocated—Relation of Oil to Piston Fit

From the Paper by Harry Tipper, Read at the Summer Meeting of the S. A. E.

THE efficiency of lubricating oil depends largely upon its ability to maintain a film between the metal surfaces, the extent of fluid friction in the oil film itself as against the friction of metal surfaces, and the amount of oil which is required to maintain the conditions of lowest temperature between the moving surfaces, and as a consequence, the saving of power due to the less absorption of such power in overcoming the friction.

In practical use the oil must vary according to the speed, pressure and heat conditions in the equipment, the amount of moisture, the mechanical arrangements for oiling, together with the question of settlement and filtration. Innumerable modifications may be necessary in the grade of oil required; for instance, the question of dry and wet steam in the cylinders of a steam engine, superheated steam, character of circulating systems, the fit and finish of bearings, etc., all exercise a modifying influence upon the oils which can be used.

Old Specifications Are Inadequate

The common method of specifying lubricating oil which has been in use for a great many years is to stipulate a certain gravity, flash, fire, viscosity and cold test, under the assumption, of course, that such limitations of the tests mentioned will have the effect of obliging the manufacturer to submit an oil which will do the work to the best advantage. A thorough examination of these tests, however, shows that they are not by any means conclusive of the value of an oil for lubricating purposes. In regard to some of them, the results are entirely misleading.

Taking these tests in detail, let us examine the question of gravity in respect of the present day conditions.

Gravity is simply the weight of the liquid in terms of weight of water. On the Baumé scale, which is the scale in practically universal use in the oil business, the gravity is expressed in arbitrary figures, with the lowest number on the scale representing water and the numbers increasing as the liquid becomes lighter in weight. Gravity was first introduced in lubricating oil specifications because in comparing oils made from the character of crude which was used at the time, it bore a relation to the viscosity or body of the oil. This is not true, however, of some of the other crudes which are now supplying a considerable proportion of the lubricating oil used, as in some of these crudes the viscosity or body may change from 200 seconds to 2,000 seconds, while the gravity reading will remain the same. I have lately seen a sample of a crude oil which was heavier than most of the crude oil found, and possessed at the same time no viscosity greater than water. Further, gravity bears no relation to viscosity whatever when comparing lubricating oil made from two different crudes. In one case a 28 to 30 gravity oil may run 180 to 200 viscosity, and in another case the same viscosity may be secured with a reading of 19 on the Baumé scale. The gravity reading is practically of no value to anybody but the refiner, who can and must use it in comparing the uniformity of his runs from the same crude.

The flash and fire tests are represented respectively by the temperature at which oil, being heated at a standard rate, with a standard flame, passed over it at a standard distance, will show a flash or flame from the gases arising from its surface, and the point at which the oil under the same conditions begins to burn.

From the standpoint of lubrication, the only bearing which the flash and fire tests has upon the oil under service, is to insure against the presence of volatile constituents which might begin to vaporize at the temperatures reached in ordinary work.

The viscosity test is represented by the length of time which is required for a specified quantity of the material to pass through a specified orifice at certain temperatures, and the viscosity reading is always expressed as the number of seconds it takes the above-named conditions to be fulfilled. The viscosity of an oil has a considerable bearing upon its value for lubricating purposes, as it determines the speed of flow of the oil under certain temperature conditions, and it is obvious that the rate of flow of the oil is of great importance in considering conditions of pressure and speed in connection with all ordinary lubricating work. The trouble with the viscosity specification as it is used at present arises from the fact that the viscosity depends upon the temperature at which the oil will work, and if this temperature varies considerably from the standard temperatures at which the tests are usually made, there will necessarily be a great deal of difference in the usual working of the oil under the practical conditions involved. Furthermore, the variations in viscosity of lubricating oils made from different crudes are not the same for different temperature conditions. Finally, the viscosity of lubricating oils made from different crudes does not by any means indicate the fluid friction which is set up internally in the use of the material.

The cold test is of importance as demonstrating the ability of lubricating oil to remain fluid under conditions of exposure to low temperatures. Its value, however, depends entirely upon the work to which the oil is to be put. The cold test is sometimes made by reducing the temperature of the oil and taking the point at which it becomes cloudy; again by reducing the temperature and taking the point at which it refuses to pour out of a standard orifice in a standard quantity. The cold test is a question of the ability of the lubricating oil to meet the practical requirements of the working conditions, and it is evident, therefore, that an oil which will flow at a point in temperature as nearly as possible the minimum temperature experienced in actual conditions of use will be most available for the purpose.

Test Readings Show Wide Variations

The point, however, which should be noted in connection with all these tests on specification for oils is that they do not demonstrate the value of the oil under practical conditions, and merely put a limit upon the competition which can be secured or upon the amount of oil which can be drawn from for use, without in any way furthering the value or advantage. To put this matter concretely, engine oils manufactured from different crudes show the following variations in the characteristics.

Gravity	19° to 31°
Flash	320° to 400°
Fire	370° to 450°
Cold	0° to 30°
Viscosity (on Saybolt instrument) or higher at 100° Fahr.	120° to 750°

Within this range of characteristics oil suitable for all classes of engines can be picked out, and the question of their suitability would not depend upon the particular tests displayed by the oil. Two oils answering the same laboratory tests might show entirely different results in actual work, due to difference in the methods of manufacture not appreciable in a laboratory inspection; one would lubricate and the other would not.

Inasmuch as the arbitrary tests to determine the physical characteristics of the oil do not illuminate its value for any particular purpose, let us consider what the oil should do. In order to bring this directly to the point of greatest interest to the Society, that is, the lubrication of the motor automobiles, let me suggest the requirements which a lubricating oil for this purpose should meet:

1. The oil should possess a sufficient body to keep the bearing surfaces apart at the temperature at which the bearings run.
2. It should possess such qualities as will reduce the friction to a minimum.
3. The flash point should be sufficiently high to insure against the presence of volatile constituents.
4. It should remain in fluid at such low temperatures as will be met in service conditions.
5. It should have no tendency to decompose or to form such deposits as will gum up the machine and increase the friction, where the object is to decrease it.
6. It should contain no ingredients which will corrode or pit the metal.

Piston Leakage Is An Important Consideration

In considering the qualifications to be added to these general requirements in order to define application to the mechanical conditions of cylinder lubrication, it is necessary to consider the questions involved in the operation of an internal combustion engine. After a charge has been taken into the cylinder on the suction stroke it is compressed to from 50 to 75 pounds before being fired. Naturally upon the starting of the compression stroke there is a tendency for the gasoline mixture to leak. There are two pays of obviating this difficulty, of securing full compression. These two ways might be stated as mechanically secured compression, formed by the close fit between the piston or piston rings and the cylinder wall; or compression secured by liquid seal, which means the use of an easy clearance between the piston rings and the cylinder wall and the sealing of the

space between them by the use of a proper kind of lubricating oil.

The motor after leaving the factory is run at great variations of speed and considerable variation of load. These variations are quite rapid and frequent. On account of the mechanical conditions of the motor you have recommended a very thin, light lubricating oil for the motor, under the guarantee. This lubricating oil has no particular adhesiveness and will flow as readily from the cylinder wall as to it. Consequently, during the rapid and frequent variations of speed, cylinder walls are sometimes overburdened with oil and sometimes practically dry, making wear and tear extensive and naturally resulting in a rapid increase in the space between the piston and cylinder wall.

Escaping Mixture Destroys Lubricating Oil

This wear and tear is not thoroughly even; the clearance is larger in some places than in others. Then the lubricating oil flows freely up and down the walls of the cylinder and there is never any time when just the proper amount of oil is on the cylinder wall. The oil is so thin that it cannot be held in the increased space, consequently on the compression stroke the gasoline mixture escapes past the piston, destroying the lubricating oil in the crankcase, and reducing from 15 to 30 per cent. the power which should be secured from the gasoline. You have seen from time to time in your experience with races, racing motors, etc., that after a three or four hours' run the oil in the crankcase has had to be dumped because it was so light in body as to be like water. I have heard some drivers, and also some engineers, thoroughly well acquainted with the motor, try to explain this fact by saying that the oil decomposed. Such a thing is, however, unknown in the oil business. In all other cases of the use of petroleum oils for lubricating, length of use only makes the oil a little heavier and a little darker in color. In no case has it ever been found possible to use an oil for lubricating purposes and secure a lighter product. This can be done by admixture only. In the course of our work in the recommendation of oils for motor purposes we had occasion to notice this peculiarity, to test it out, and found it almost invariable. Taking samples of oils at the beginning of the tests (all the tests being made with a 6-cylinder 60-horsepower automobile engine, arranged on the block with brake, necessary tachometers, measuring and weighing instruments, thermometers, barometers, and all requirements for thorough reading during the course of the test) and analyzing them; taking samples at the end of the tests and analyzing we found a reduction in the flash and fire of from 100 to 150 degrees, showing the presence of volatile constituents, a great reduction in the viscosity, so great in general as to have destroyed largely the lubricating value; and upon distillation a certain amount of product answering to the gasoline test was recovered.

Consider instead of the mechanically secured compression used in connection with thin oil, compression which depends upon the use of lubricating oil, the clearances being larger. From the standpoint of the mechanical efficiency of any power generator the mechanical fit which absorbs the least amount of power due to friction is an easy sliding fit. If dependence is to be laid, however, upon the metal and not upon the lubricating oil to maintain compression, this easy sliding fit is too loose to give the compression required. If, however, it is intended to secure the compression by the liquid seal of the lubricant, then an easy sliding fit can be given to the motor, a sufficiently heavy-bodied oil used for lubricating with the result that the metal surfaces can be kept apart, the compression can be maintained so that there will be practically no change in the lubricating oil in the crankcase and only the ordinary wear and tear on a properly lubricated surface will take place.

Carbon Is Formed From Lubricant

Further, the condition under discussion is responsible largely for the carbon which is so constantly being experienced on account of the fact that the oil, being very light in body and free-flowing, is drawn up during the suction stroke into the compression chamber and on to the piston head, where it is distilled, leaving a coke baked on the piston head to the first ring, upon the valves, etc.

In working out lubricating oils for automobile engines we are using today oil of 200, 300, 500 and 750 viscosity; the oil of 200 seconds viscosity being used entirely for those motors which are being made with clearances too small to permit of the oil of the proper body being used. Thousands of tests by private owners, which, while they may not be accurate, indicate the general result that in practice by the use of these heavier oils they have secured from 10 per cent. to 20 per cent. and in some cases over 30 per cent. more power from the fuel, owing to the saving of any loss on the compression stroke. On this account they have also used less lubricating oil, due to the fact that there is no admixture of gasoline, deterioration consequently being very slow. There is also less wear and tear on the cylinders and practically no trouble from carbon formation.

Harry Tipper, who read the paper on Lubricating Oil

When we first got records of 16,000, 20,000 and 25,000 miles with one set of spark plugs, and no carbon trouble, although some slight deposit, we were apt to put the figures down to enthusiasm and question their accuracy; but with the number of automobiles we ourselves are using, with the tests of which we have been able to keep some accurate control, and with the reports received, of which we have no means of knowing the accuracy, it is evident that the carbon trouble, as far as we are concerned, has been practically eliminated by the investigation into this question of mechanically secured fit or liquid seal for compression and of the deterioration of the lubricating properties of the oil in the crankcase.

Piston Clearances Are Too Small

Nevertheless, it remains true of all our tests, experiments and information that the general practice of the motor manufacturer in this country has been to use clearances between piston and cylinder wall which were entirely too small and to use lubricating oil which was entirely too thin. This was undoubtedly due to the attempt to get away from carbon troubles and gummy deposits, but a little reflection will show that the excessive carbon troubles are mainly to be connected with too thin an oil. While oils from some crudes, of course, give only soot, and other oils give coke when burnt in the combustion chamber, the carbon in each case is due to the presence of oil where it has no business to be and where under proper mechanical conditions it would not arrive. Provided the oil has sufficient body to adhere to the cylinder wall and the piston rings so that at all times a perfect, or practically perfect, seal is maintained practically no oil should get up into the compression chamber, onto the valves or the piston head, inasmuch as if the oil has sufficient body to adhere to the cylinder walls during compression it will have no tendency to climb during the suction stroke, and consequently at no time will there be any large amount of excess oil where it will be affected by combustion. I have no doubt whatever that the motor manufacturer has in the past made a mistake in pressing the oil companies to give him a product which would not deposit any carbon, instead of examining the mechanical conditions of his motor and finding out whether it was necessary to burn oil. Under some conditions it is impossble to avoid carbon. The character of the carbon depends partly upon the character of the crude, the method of refining and the character of the oil made necessary by motor mechanical arrangements, but the cause of the continued presence of excessive carbon and continual trouble with carbon should be looked for, it seems to me, in the mechanical conditions of the motor. When these mechanical conditions are examined it will be more fully determined that we have not been securing the economy which should be secured from the fuel or the lubricating oil and that the depreciation due to excessive wear has been too rapid.

View of proposed clubhouse to be built by the Republic Rubber Co., Akron, O.

Republic Rubber Co. Builds Clubhouse

Entire Building for Use of Company's Workmen

FOLLOWING out a plan which has been under consideration of the board of directors for some time, the Republic Rubber Co., Youngstown, O., is commencing construction of a clubhouse for its men. The building will be located on high ground, facing the general offices of the company, and across Albert street from the main entrance to the plant. The structure is 135 by 60 feet and will be of brick, completely fireproof. If there are no unexpected delays, it will be ready for occupancy in the fall of 1913. Mr. Robinson, the president of the company, is the originator of the clubhouse and is very much interested in the same, as it is a good step towards adding to the peace of mind and comfort of his employees.

The main floors are to be devoted entirely to the use of the workmen of the company. The ground floor will contain several bowling alleys, a billiard room, reading room and shower baths. The story above will contain a lunch room, capable of seating 1,000 men at tables, and at one end will have a lunch counter where coffee, sandwiches and similar things will be sold at cost to those who may desire to buy their lunches or wish to supplement the lunches brought from home. It is proposed to construct the tables so that they may be shoved together, forming a platform or stage for the use of the factory glee club, band or relief association.

The top floor of the building will contain a dining room for the employees of the general offices; a suite of rooms for the manager or steward of the clubhouse, and a dormitory for the factory fire department.

There will be tennis courts, a baseball diamond and athletic field in connection with the clubhouse. The company has devoted 8 acres of ground to the clubhouse and athletic field.

The method of operation has not been fully determined, but the present plan is to leave the management of the building very largely in the hands of the men themselves. No one will be asked to make use of the clubhouse unless he so desires, and, in a general way, the idea will be to emphasize the club feature. Employees who wish to do so may become members on the payment of nominal dues.

It is confidently believed that the undertaking will be successful in many ways, but especially in giving the men a place for spending the lunch hour, under pleasant surroundings, and away from the factory buildings.

This undertaking is on the same plan employed in Akron, where adequate living facilities must be provided for its large industrial army as well as a place away from the factory atmosphere. The factories themselves are aiding in the work of providing homes for their men.

Factory libraries have been established, where the men may go after working hours or in lunch hours. Restaurants, where wholesome food can be obtained at a nominal price, have been installed right in the factories of several of the other large tire concerns. Welfare departments have been started for the betterment of working conditions, to ferret out the weaknesses in the organization, always working for efficiency on the part of every member of the organization.

Hotels have been established for the newcomers to some of the various factories. Here they may stay at very low rates until a new home has been located.

One of the tire concerns publishes a factory newspaper, full of news for the men who are employed in the factory. It keeps them posted and interested in the affairs of the company.

One prominent Akron concern maintains a fully-equipped emergency hospital off in a quiet wing of one of the buildings. Kept in immaculate condition, this hospital has the most modern of surgical equipment.

The factory directors realize that the best policy is to have the workmen satisfied, an important factor in the success of the concern. Fair treatment is accorded all, and special privilege to none. The various concerns are looking every day for additional comforts, where the monotony of the day's work may be forgotten in some recreation or clubhouse, such as the Republic Rubber Co. is now building.

Library Books Delivered By Automobile

Hagerstown Free Library Widens Its Distribution Area

DELIVERING books from door to door to dwellers in farm houses and mountain cabins is the unique use made of an automobile by the Washington County Free Library, of Hagerstown, Md. The vehicle is said to be the only one in the United States constructed especially as a bookcase on wheels.

Previously a horse-drawn vehicle had been used by this library for the same purpose, but on this suffering demolition as the result of an unfortunate contact with a railroad train at a level crossing it occurred to the up-to-date mind of the lady librarian, Miss Titcomb, who is the originator of this form of book delivery, that a more satisfactory substitute would be found in the automobile.

The traveling bookcase shown in the accompanying illustration is the result; and this novel vehicle has traversed, since its first trip in March, 1912, over 6,000 miles of roads in the surrounding districts of Washington and has left at homes almost 4,000 books. The duties fulfilled by this useful accessory to the distribution system of the library also includes the delivery of boxes of books to various branch libraries throughout the county, not conveniently reached by railroad or trolley, to public schools and to Sunday schools.

As an indication of the utility of this new method of book delivery it is interesting to note that the librarian states that ever since its introduction there has been a constant demand for books of a practical nature, and everywhere the farmers are looking to the library for the best and latest works dealing with methods of truck gardening, fruit growing and with agriculture in all its phases.

A trained librarian always accompanies the chauffeur to help readers make their choice from the volumes thus brought to the front door.

This traveling bookcase, as will be seen from the accompanying illustration, is a light engined vehicle having much the appearance of the ordinary light delivery van as used by grocers and other tradesmen. It runs on four solid rubber tired wheels of large diameter. Final drive is by chain and the body is supported on full-elliptic springs at both front and rear.

Hagerstown, the headquarters of this novel work of education and entertainment made possible by the traveling bookcase, is in the heart of a region noted for historic interest and picturesque environment; one frequented by touring automobilists from all parts of the country. Nearby the Potomac River flows past many famous spots, including the quaint old town of Harpers Ferry, where occurred the John Brown insurrection. Nearby also the battlefield of Antietam stretches out around the village of Sharpsburg, little changed in appearance in 50 years, except by the erection of many fine monuments and the construction of an excellent system of government roads. Gettysburg is but a short run to the tourists, following the trail where armies passed in the fateful year of 1863. The oldest monument to George Washington, a pile of native limestone rock, surmounts one crest of the ridge of South Mountain, and the War Correspondents' Arch, built by George Alfred Townsend with the co-operation of Sir Henry Stanley and many others who described battles, is not far away. In the background the Blue Mountains provide an enchanting view.

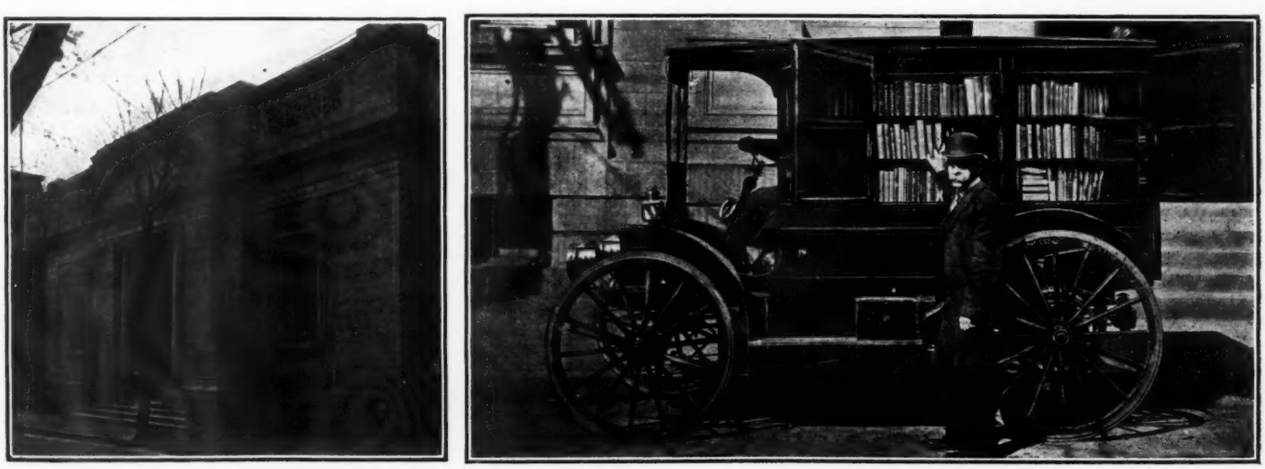
Eleven fine pikes radiate from Hagerstown, one following the route of the old National Road that linked East and West before the railroads supplanted the stage coach and Conestoga wagon as the favorite modes of transportation.

The progressiveness of this little Maryland city is further shown by the fact that its fire department equipment includes two modern pieces of automobile fire apparatus costing nearly $10,000 each.

The number of privately owned automobiles in proportion to the population is much above the average. It is estimated that there are no less than 350 cars to a population of 25,000.

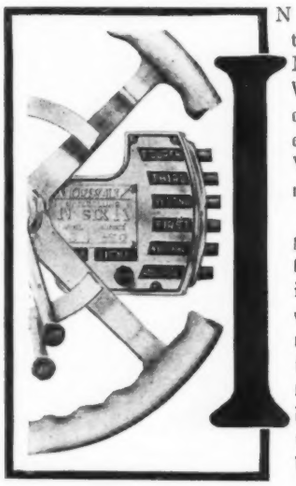
Road Testing in England

Elaborate experiments are being carried out in England on a special track at the National Physical Laboratory, Teddington, in order to discover a road material that will provide a dustless, smooth and wear resisting surface—a matter of extreme interest to automobilists. Rolling and crushing tests form an important part of these experiments, and there is an ingenious road-destroying machine which, when run for 24 continuous hours, represents a year's traffic wear. There is also apparatus by which the temperature may be varied so that the tests may be run under conditions corresponding to the various seasons. Temperature plays a considerable part in the life of a road.



Special traveling bookcase used by a Maryland city for the distribution of library books. The library is shown at the left

Norwalk Has Electric Shift



Gear control on Norwalk cars

IN making its announcement for the coming season the Norwalk Motor Car Co., of Martinsburg, W. Va., places itself upon the list of those who have adopted the electric gearshift. Henceforth the Vulcan device will be stock equipment on the Norwalk output.

The use of the Vulcan electric gearshift in conjunction with a three or four-speed selective sliding transmission in no way involves any constructional changes, merely adding other shifting forks and means to slide the gears to replace the conventional shifting forks, shafts, interlocks, etc., that are operated by the hand lever method.

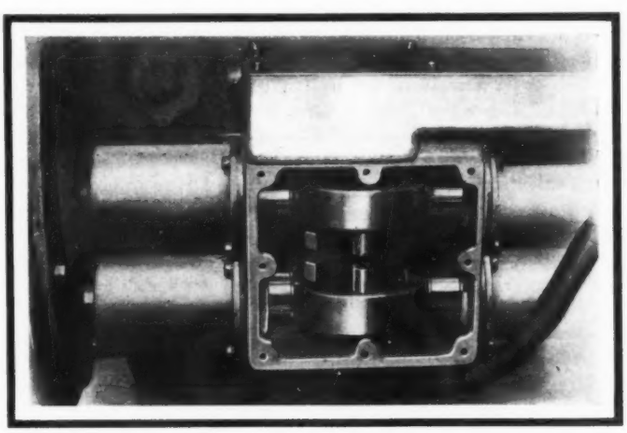
On the side of the gearbox proper, a housing is fastened by means of a finished flange contact and secured by ordinary capscrews. This box contains a master knife switch and a shaft, and when the latter is revolved approximately 30 degrees returns any and all gears to neutral. This is accomplished through a pair of curved arms, which come in contact with the studs on the gearshifter forks and are operated manually by connection to the clutch pedal. Attached to this box are a number of solenoids, which in common terms might be called electro magnets. These are wound with coarse copper wire and are inclosed in a pressed steel shell, which is absolutely water and oilproof. These coils are concentric to bronze bushings, carrying steel plunger shafts, the other ends of which are rigidly attached to the gear shifting forks.

In the case of a three speed forward and a reverse transmission, four solenoids are used, two on each end of the electric gearshift box, and as it is well known on this type of construction, two gears are pulled forward, giving a low and direct or high, and when pulled in the opposite direction, reverse or second speed is brought into mesh, depending on which has been selected, and therefore the two solenoids mounted in front are those used for first and high, and the ones to the rear for reverse and second speeds. Interlocks are provided in the forks to prevent any gear from overrunning its neutral point. This precludes any possibility of double meshing.

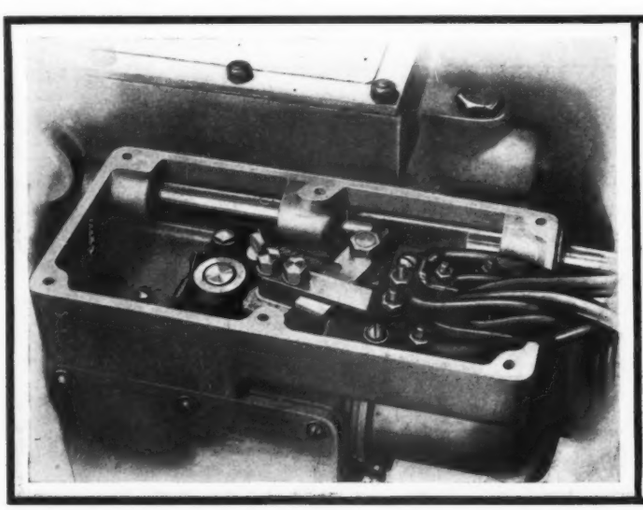
The conventional clutch and operating pedal is employed, which is connected to the master switch and neutral cam mechanism on the electric shifter box by means of an adjustable rod, a cross shaft, and two short levers. These latter parts are merely to convey the motion from the pedal side to the shifter side of the transmission.

An elongated slot is incorporated in the yoke, which attaches to the clutch pedal, so that approximately 3 inches travel is allowed on the pedal pad before any movement is obtained in the gearshifting mechanism. This is sufficient to fully disengage the clutch and permits of slipping the clutch or coasting and other miscellaneous declutching other than that required for gearshifting without bringing the gears to neutral.

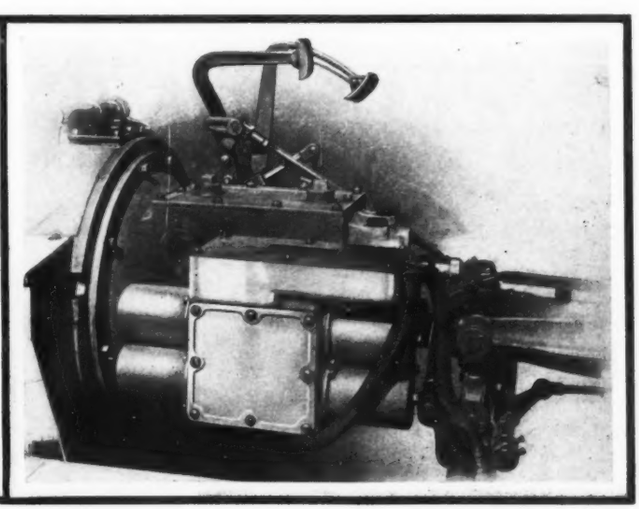
The advent of the electric gearshift has given rise to a discussion relative to the amount of current drawn from the battery; but it has been found under ordinary conditions that a maximum of 30 amperes has been consumed and this only for approximately one-third of a second, which is only the time



Top view of Vulcan electric gearshift on Norwalk cars



Interior view of Norwalk adaptation of Vulcan electric shift



Exterior view of application of electric gearshift to Norwalk cars

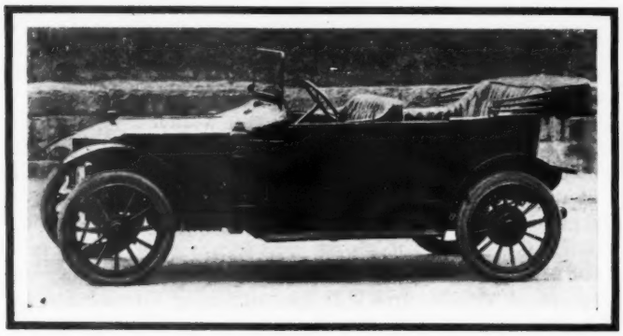


Fig. 1—New Cameron car with pointed radiator

consumed in pulling the gear into mesh, after which the current is broken and the gear is held by the usual interlock. The tests of the consumption and operation were made on the device when attached to an experimental car. After having been driven 3,000 miles, readings were taken with three different ammeters, all separately calibrated.

The pull of the coil approximates 35 pounds at a 1⅛-inch air-gap. This increases as the plunger passes further into the magnet shell.

The operation of the electric gearshift is as follows: After the engine is started, it is naturally advisable to start on low, or first, gear. The first speed button, Fig. 1, is depressed and the clutch pedal pushed to the limit and the gear is in, the click caused by the meshing of the gears being heard. The clutch is then allowed to go into engagement and the car moves off. While in first gear, the second speed button is depressed, which automatically releases the first speed button and the clutch is again depressed to the limit of its travel, and in consequence the first speed gear returns to neutral and the second speed gear is pulled by the solenoid into mesh, but only after all gears are in neutral. The clutch is then disengaged and the car moves off on second. The subsequent depressing of the additional speed buttons and declutching as before engages the next gears, and so on.

When running in any gear and desiring to stop the car, the neutral button is pushed and the clutch pedal depressed, thus bringing all gears to neutral and closing no contacts whatever, it being simply a mechanical operation. Any button may be chosen in preference to the one previously determined and thus obtain the gear last selected, and the button may be depressed in anticipation of a shift, be it one second or one hour before the shift is desired, thus insuring the driver of an instantaneous shift by pushing the clutch pedal at any time.

The average electric starter spinning the motor at 60 r.p.m. requires an additional current of approximately 125 amperes to start the flywheel into motion and 90 amperes to continue this until the motor starts. It can be readily seen that the average current per second is about 105 amperes for two seconds as against the average of 25 to 30 for one-sixth of that time, making it little or nothing in comparison.

A generator at its nominally efficient speed will produce from 15 to 18 amperes, and therefore it is but a very short time until the current required by the solenoid is replaced.

After a test it was very noticeable when the cover of the transmission was removed that not one evidence of misuse could be detected on the teeth of the gears, after probably 5,000 shifts under all possible conditions and by at least two dozen drivers, the great majority of whom were not familiar with the mechanism of the device.

The clutch and brake pedals are of course used, the latter being made with a divided pad allowing for separate operation of either emergency or service brakes or simultaneous action of all brakes if desired. The emergency brake pedal is fitted with a magnetic latching device which can be brought into action by merely depressing a suitably marked button on the steering gear.

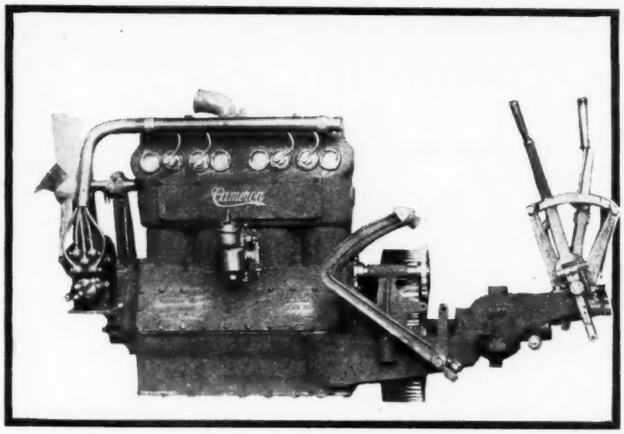


Fig. 2—Side view of the block motor in the new car

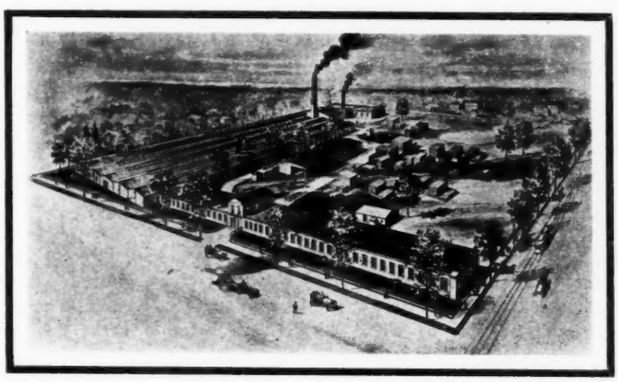


Fig. 3—Converted piano factory now used for Cameron

Cameron Re-Enters the Field

HAVING taken possession of a new factory, the Cameron Mfg. Co. has been re-incorporated and is about ready to turn out a brand new car. The factory, which is shown above, was that of the Mathusek Piano Co. and is located at West Haven, Conn. The re-capitalization is $1,000,000 and the officers of the company are E. S. Cameron, president; F. S. Corlew, vice-president; A V. Emerson, secretary and treasurer. The directors include the officers of the company, Henry F. Parmelee, A. H. Bennett, John T. Kenworthy and E. W. Johnson

The plant covers 6 acres of ground, has 75,000 square feet of floor space, all on one floor, and consists of two buildings, one 420 feet long and 120 feet wide, and the other 330 feet long and 75 feet wide.

The Cameron cars will use a four-cylinder water cooled block motor of the L-head type. The valve action is entirely inclosed by a cover plate which when removed renders all adjustments accessible. The valves are operated by rocker arms which are automatically oiled from the crankcase. Among the other prominent features of the car are the following:

Lubrication automatically carried to all moving parts from oil reservoir in base without pump or complication. Cone clutch leather faced in flywheel, self-adjusting.

Gasoline tank in cowl dash, giving a good flow of gasoline to carbureter on any grade.

Gearset Cameron patented system, four forward speeds and reverse, with a direct drive on all speeds.

Front axles, tubular, low drop, with hubs flush on outside. Rear axles, floating, with underslung rear springs; all bearings annular.

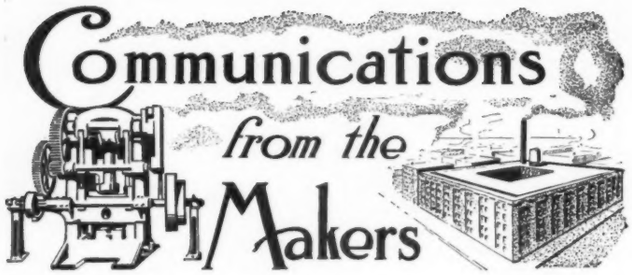
Springs, front, elliptic; rear, elliptic, with scroll ends.

Brakes, 12-inch internal expanding; width, 2½-inch face.

Wheelbase 115 inches.

Equipment: mohair top, side curtains and top boot, speedometer and complete tool kit, tire repair outfit, pump and jack and a mechanical starter, at $975 f.o.b. New Haven.

There is also the special Yale Flyer model, with wire wheels, demountable hubs, electric self-starter and light, pointed radiator; left drive and center control; same chassis, at $1,200 f.o.b. New Haven.



Requirements of Cast Steel Wheels

How Strains Are Avoided and How Shocks Are Distributed Over the Entire Wheel—Are Made to S. A. E. Standard

DAYTON, O.—Editor THE AUTOMOBILE:—Among the subjects occupying the earnest attention of automobile engineers at the present time, that of the steel wheel stands out prominently. The reasons for this immediate interest are: First, that the highest quality of wood for truck wheels is being exhausted and an inferior grade resorted to; second, that the variation in size of wood wheels is causing a great deal of trouble; and third, that climatic conditions make it impossible to use wood wheels successfully in dry countries, such as California, Montana, etc.

The most serious of these objections, that of the uncertainty of obtaining accurately dimensioned wheels in wood, is caused partly by the number of parts necessary in building up and also because of the inherent nature of the material itself, by which variation in size according to the moisture or temperature of the prevailing atmosphere, results. If the wheel is over size, it is difficult to put on the tires; if undersize, tires are apt to creep when going down hill with brakes set. It also often happens that the wheel, even if the actual size is correct is not absolutely true, sometimes being as much as .4 inch out. This is, of course, extremely hard on the tires.

While the steel wheel can claim to be free from the objections enumerated above, disadvantages peculiar to the metal wheel are manifest in actual practice on the road. These are: excessive weight, development of cracks and non-resiliency. But these three points are largely due to improper design. It is possible by correct design practically to overcome all of them.

Development is proceeding rapidly. The same agencies that are responsible for the gradual perfecting of the motor truck are undoubtedly bearing also on the improvement of the wheel.

The question of weight of the steel wheel is rapidly being solved. Designers and foundrymen are constantly striving for thinner sections, and .25 inch thicknesses are common today.

The development of cracks in the metal presents a serious problem. These develop not only in the foundry but also in service on the road. The reason is twofold: either the metal is at fault or the design, and as the latter represents the crux of the entire proposition it may be of interest to outline the important points to be taken into consideration when casting steel in thin sections.

All iron, steel or ingot castings are composed of crystals that run as regularly as the fibers in wood, and as the weak points in wood are where branches run out, so are found weak points in steel or iron where intersections occur. Crystals form regularly and at right angles with the contour of the casting at all times. In a casting the shape of an angle, as represented at A, Fig. 1, they are formed at right angles from each side of this casting. At XY two crystal formations meet and cause the line of weakness.

In the case of B, the line of greatest weakness is also easily seen. The crystals run regularly all the way along the straight side of casting, but the formation of crystals is changed on the side where intersection occurs. To overcome this irregularity at intersections, heavy fillets have been resorted to, but not with gratifying results. Though the crystals are being formed more regularly, the amount of metal in a fillet addition, together with that caused by a lug or arm is apt to result in shrink holes, also the grain is coarser at that point. These shrink holes, S, as shown at B and C are very irregular in form and size, so it is apparent that fillets are but a doubtful remedy, and serve the purpose but little. However, where such shrink holes occur, a core might be used to excellent advantage.

The casting shown at D, Fig. 1, is a combination of B and C, making use of the core. The ideal design in which these fibrous intersections are avoided is shown at E.

Having disposed of the question of weight and lines of weakness, the vital problem of resiliency is still to be met. Resilience

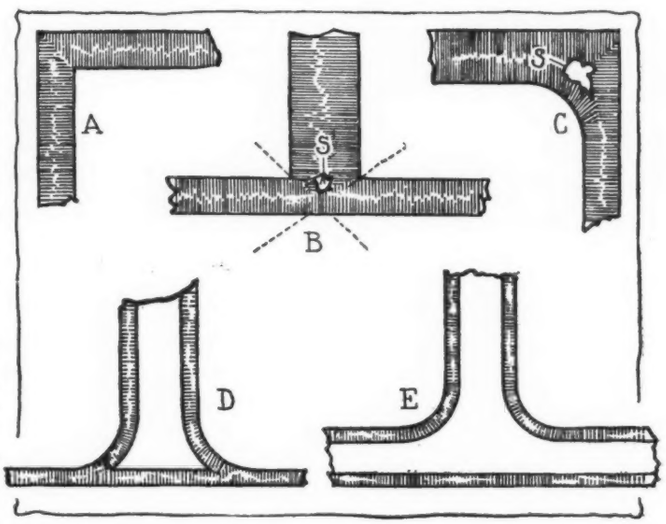


Fig. 1—Showing formation of crystals in a casting in angle shape and the weaknesses in the metal caused by irregular crystallization

is the power of metal to assume its original shape and size after distortion by application of force. A solid iron or steel wheel is not resilient; as a mass it does not receive an impression nor can its shape be distorted by shocks. Wrought or malleable iron is not resilient. It may take impacts, but these are received only at the point of the blow. In other words, the shock is not distributed and there is only a slight return to the original shape when the force is released. It takes a set very easily. To further illustrate this point: if a wrought or malleable iron ring is struck a 50-pound blow, it will bend in the direction of the blow and the hand holding it in position does not feel the stinging pain as if this ring were of fairly high carbon steel. The steel ring when struck takes up the blow and vibrates to such an extent as to cause it to bounce on its support, whereas in the case of wrought or malleable iron, the blow is transmitted to its support. Because of the low elastic limit of malleable or wrought iron, severe repeated shocks easily go beyond that limit, causing fractures and coarse grain. A resilient wheel is less apt to develop cracks, as shocks are instantly transmitted over the whole wheel and thus lose their force at the point of contact.

Elasticity or resiliency is very important, and must receive most careful consideration in truck wheel construction. The elastic limit in steel is dependent upon the carbon contents. It

is obvious that the wheel having resilient qualities is best adapted for wheel purposes. Road shocks and impacts cannot be eliminated. They must be taken care of so as to do the least possible harm. In a wheel not resilient, the energy represented in a road shock is transferred direct to the axle, minus that which is expended in overcoming inertia or motion. Materials having a low elastic limit are not suited for truck wheels any more than malleable or wrought iron are suitable for springs.

While the material of a truck wheel is important, the design is equally so. F, Fig. 2, represents a wheel which will hardly answer the purpose of a truck wheel. The hollow spokes join the rim at almost a right angle, and no effort is made to eliminate the line of weakness shown in Fig. 1. Furthermore, the overhang of the rim is great and shocks are transmitted to only one or two spokes on account of the flat rim. This wheel would break in the spoke near the rim. At H a hollow spoke joins the hollow rim, but still no effort is made in overcoming the line of weakness at joint of spoke and rim. But the hollow rim allows shocks to be distributed somewhat over the whole rim rather than just between two spokes. However, the break would occur at the same place as in the preceding example.

At G, a wheel is shown having a channel section rim and maltese section spokes running the full width of this rim. Thus overhang is reduced to a minimum. This rim is resilient and will not bend on account of the flanges, but nevertheless a blow upon a spoke is transmitted directly to the axle to a large extent.

The channel section represents the most important feature of correct rim design. In this form of rim, a shock delivered to the rim between the spokes is immediately transmitted to the flanges and they are able to vibrate almost independently of the wheel

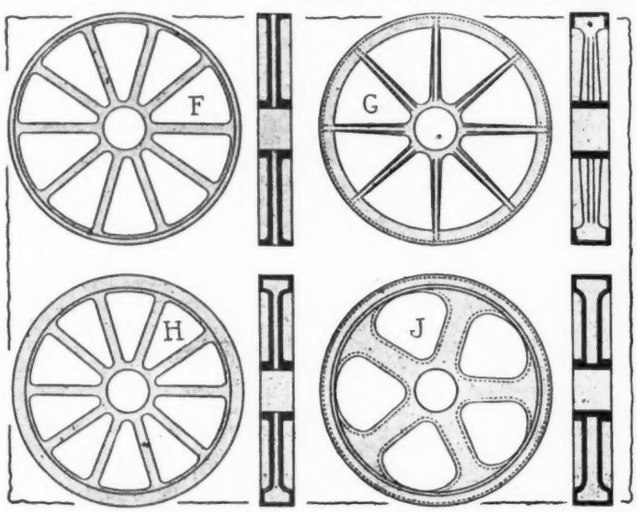


Fig. 2—F represents a wheel which would not be suitable for truck use, as there is no provision for distributing the shocks over the entire wheel. G is better, but still imperfect, as is also the case with H. J is the best design

itself. Thus the shock energy is dissipated in the manner of the vibrations at the end of a tuning fork. But it is essential in order to secure these vibration properties that the rim be free at one edge, a point which will be evident on reference to the example at J where the hollow rim is too stiff and incapable of this vibration. This design of wheel also has the disadvantage of increased weight over the type shown at G.

The above considerations will show that in the perfectly balanced wheel shocks should not be taken up in the rim only, but they should be distributed over the entire wheel, that is, vibrations should be set up that will render the development of cracks impossible, or at least much more difficult. In the wheel shown in the section, Fig. 3, care has been taken by the designer to embody these fundamental points. All angular joints between rim and spoke are avoided. Instead of joining the spokes to the rim they are in one continuous integral part, light and of even thickness. The light, resilient channel section is maintained. Shocks are taken no more by the rim than the spokes. There is no obstruction to the course of vibration. On a blow being struck at the rim the resulting vibrations are instantly transmitted to the spoke and from there again to the rim and so on. But if the spoke were of the right angle junction type as at F, Fig. 2, the vibrations from a similar blow would stop at the spoke. The spokes cannot swing with the rim, as it were.

These wheels can be made to S. A. E. standard and will take any type of S. A. E. flange-attached tire.—GEORGE WALTHER, President, Dayton Steel Foundry Co.

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Hard on the Carbureter Makers

DETROIT, MICH.—Editor THE AUTOMOBILE:—Roughly speaking, when the problem of carburetion was first put into concrete terms by Commandant Krebs in 1902, if our memory serves us right, he said that if one of the openings for gasoline or air be constant, the other must vary with the vacuum and that, practically, it is simpler to make the air opening vary. This is the principle at the root of all carbureters with automatic air valves, whether they be spring control, ball control or gravity control; whether they control at the same time a metering pin or not; whether those air valves be connected or not with the throttle—our principle has been to keep air suction constant and vary the quantity of fuel by the use of a compound nozzle, the flow of which follows certain well-known laws, the law for those two nozzles being different and producing an effect which may with all propriety be likened to the effect produced in an electric generator by the series and the shunt field coils.

We think that your work in the paper would be a great benefit to the public if you could make this subject of carburetion less of a mystery than it is now. The carbureter is blamed for everything, when as a matter of fact the carbureter is, as we make it according to our principle, quite a standard piece of apparatus, very reliable in action and in its results. The carbureter manufacturer is compelled to maintain a service department, and nine times out of ten it has been our experience that nothing was suspected of being the cause of poor motor action but the carbureter, and that it never enters the mind of the average owner that his valves may be dirty or riding, or his valve springs weak or his plug dirty, leaky or set with the terminals too far out, or that his gasoline tank is full of water.

We are only too glad to set things right when we are at fault, but we think that in many cases we are the goats, and as we are not in business for philanthropy somebody is bound to pay for them.—N. R. HEFFLEY, president, Zenith Carbureter Co.

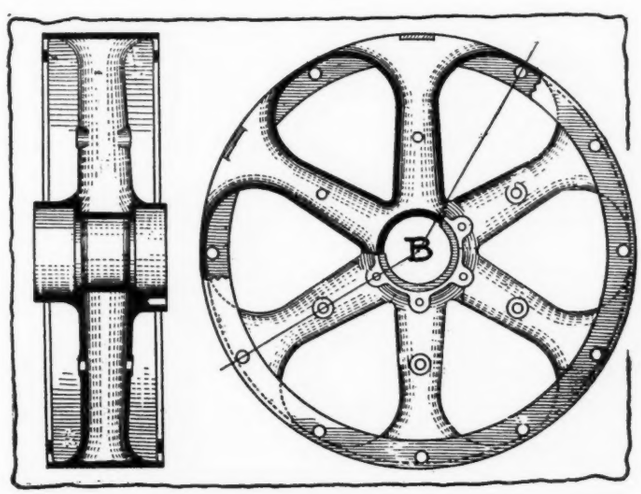


Fig. 3—This wheel is designed especially to meet the requirements of motor truck use, the shocks sustained being distributed over the whole wheel

LONG ISLAND Goodyear Plant—The Goodyear Tire & Rubber Co.'s Long Island City branch and plant is well nigh complete, and will be entirely so in about six weeks from date. As has been stated before, this branch will be located at corner Jackson and Honeywell streets. The building will be four stories high, 275 feet long and 50 feet wide. It will contain a warehouse, a showroom and also a wheel shop where tires may be mounted and wheels repaired, etc. The warehouse will have enough capacity to store all the tires required to be kept to serve Goodyear clients in the Metropolitan territory.

Buys Machine Shop Equipment—The Porter-Betsch Co., Cuyahoga Falls, O., is purchasing machine tool equipment for the installation of a machine shop and garage.

Bellefonte Company Buys Site—The Bellefonte Automobile Mfg. Co., Bellefonte, Pa., a company recently incorporated for the manufacture of motor cars, has purchased a site for the erection of a factory in that city.

Stewart, Truck Builder, Growing—The Stewart Iron Works, South Cincinnati, Ohio, a concern manufacturing motor trucks, is installing a lot of additional machinery and equipment in its new factory building.

Ford Plant for Columbus—The Ford Motor Co., Detroit, Mich., is understood to be contemplating the erection of a factory in the city of Columbus. O. Already the company has an important distributing branch in that city.

De Tamble Company Taking Inventory—The officers of the De Tamble Motor Co., Anderson, Ind., are at present very busy taking inventory of its stock, so that the production of 1914 cars will not be started for the next two weeks.

Laporte, Ind., To Get Factory—An automobile factory is to be constructed in Laporte, Ind. A. G. Tomlin, a resident of the city, is interested in the enterprise. The factory building is to be two stories high, with a space of 60 by 120 feet per floor.

Moon Makes One Car an Hour—According to Stewart McDonald, vice-president of the Moon Motor Car Co., St. Louis, Mo., the production rate of that company is now one car per hour. It is said that this rate will be continued as long as the present rush of orders keeps on.

Savage Tire Co. Increasing—The Savage Tire Co., of San Diego, Cal., is the most promising plant of that city, according to President Flowers of the San Diego Merchants' Association. The rubber stock carried by the company for the production of its tires is valued at approximately $100,000.

Tood Mfg. Co. Adds Space—The Tood Mfg. Co., Minneapolis, Minn., which for a year has been manufacturing radiators, lamps, mudgards, etc., is increasing its business facilities for the production of the devices and therefore has decided to lease another floor, in the building at 830 Mary place.

Diamond Chain Factory Annex—The Diamond Chain & Mfg. Co., Indianapolis, Ind., has purchased the building formerly used by Holliday & Wyon, and it is stated that the company will use it as an annex for its South Senate avenue plant. The three-story structure covers 66 by 145 feet of ground.

Studebaker Plans Another Plant—The Studebaker Corp. of Detroit is seeking a location on the B. & O. S. W. Railroad, in Ohio or Indiana for factory or storage plant. The company is seeking a plant adaptable to the automobile business for use as a supply plant for factory storage or assembling parts. An effort is to be made by the board of trade to secure this plant for this city.

Stewart-Warner to Double Size—It is reported on excellent authority that the Beloit works of the Stewart-Warner Speedometer Corp. originally the main plant of the Warner Instrument Co. until its absorption by the Stewart interests, are about to be doubled in size by the construction of an addition measuring 392 by 120 feet and costing more than $60,000. Shortly after the consolidation of the Stewart and Warner concerns it was announced that not only would the Beloit works be continued, but considerably enlarged. The promise is now to be kept. The original Warner instruments have been pushed hard by the speedometer corporation and the limit of capacity has been reached.

Richmond Buys Out McCrum-Howell—The Richmond Radiator Co., Philadelphia, which took over the various works of the McCrum-Howell Co., Racine, Wis., upon the settlement of that firm's receivership, has abandoned its Racine shops, devoted to electrical devices, and moved the equipment to Philadelphia. The Racine shops were known as the U. S. Standard Electrical Co. before being absorbed by McCrum-Howell.

Two Works for Sheboygan—The Sheboygan Business Men's Association has received propositions from two concerns identified with the motor car industry, to move their plants to Sheboygan, Wis. Walter A. Crowe of Detroit is looking for a location for a pleasure car manufactory. The Theomo Motor Co. of Chicago desires a site and stock subscriptions. Both propositions are being investigated and if found acceptable, efforts will be made to add the two companies to Sheboygan's list of industries.

Smelser Engine Factory Locate—The Smelser Engine & Machine Works which was recently organized in Indianapolis with $50,000 capital, has decided to locate at Mars Hill, a suburb just west of Indianapolis. Plans are now being drawn for a factory building of concrete and brick construction. The plant will be completed about November 1. A 4-acre tract has been acquired for the plant. The company has organized with the following officers: E. G. Ritchie, president; James M. Smelser, vice-president; Guy M. Churchill, secretary and Noble H. Wible, treasurer.

Luther Company Triples Capacity—The Luther Grinder Mfg. Co., Milwaukee, Wis., whose hand-power disk grinders and power grinders are to be found in many of the garages and motor car factories of the United States and Europe, has just closed a deal which will result in a tripling of its capacity. The company has purchased the site and factory building at 285-297 South Water street, Milwaukee, for $60,000 and will expend $50,000 in improvements and additions. Here will then be concentrated its entire activities, now carried on in three shops. Luther grinding machines are known all over the world and during the last two years it has been necessary to increase the production no less than four times.

Beijer Hydraulic Transmission Building—The Beijer Hydraulic Transmission Co. of Stevens Point, Wis., which was organized recently by A. P. Beijer, inventor and designer of a new type of hydraulic drive, has equipped a small shop wherein it will build a number of its transmissions in various styles and sizes for demonstration purposes. As soon as a market is developed sufficiently, it is the intention to engage extensively in the manufacture of the devices. Mr. Beijer has worked principally in the direction of developing a hydraulic drive for motor vehicles and the company will seek business in the motor industry more strongly than in any other field. W. E. Atwell is secretary and treasurer of the company.

Making Flexible Wheels in Antigo—The Holland Flexible Auto Wheel Co. of Antigo, Wis., is engaged in making up a number of sets of its flexible wheels for demonstration purposes and at the same time is making tentative plans for a factory at Antigo. The wheel is designed by Thomas J. Holland, who has been working for two years to produce a substitute for the usual motor car wheel and one that can employ solid tires, thus overcoming the principal expense of motoring. The spokes are of steel, shaped like bows, the resiliency permitting the hub to accommodate itself to the shocks of the road. As the lower spokes take up the shock by bending, the upper set tends to straighten out in response to the motion imported by the hub. The wheel can be constructed and sold cheaply. Quick repairs are made possible by the use of a novel clamping device in which no bolts or nuts are employed. In case one or more spokes should be broken by unusual shocks, it is a matter of only a few minutes to make a change.

Edwards Company May Move—The Edwards Motor Car Co., Long Island City, N. Y., is contemplating removal of its plant to a western city. Charles J. Stoddard, an officer of the company, has been making visits to several cities in the West with this in mind and among other cities is considering Louisville, Ky., as a location for the company's factory.

Perfex Announces New Truck—The Perfex Co., Los Angeles, Cal., which manufactures a pleasure car under that name, has added a 1,000-pound delivery wagon to its output. According to President Paul Brown of the factory, the truck will have a 20 horsepower motor of the T-head type, with an anti-smoking device incorporated in the pistons. The frame will be of laminated wood, with full elliptic springs front and rear. It is the intention of the makers to design the car so as to allow of a speed of 35 miles an hour, if desired.

Shorter Working Hours for Women—In appreciation of the faithful work of the large force of women employed in the offices of the Thos. J. Jeffery Co., at Kenosha, Wis., the company has issued formal notice that women employees will be required to work but 8 hours per day. In addition, they are given a Saturday half-holiday and an annual vacation of two weeks under full pay. The new executive building has recently been completed and is now occupied. It contains every convenience known and is particularly designed for the comfort of the women employees.

Rands Buys Warren Plant—By the auction sale of the entire plant and equipment, recently, the active career of the Warren Motor Car Co., Detroit, Mich., was closed, as there is little chance of the Warren-Detroit car being continued by the new owner. The property was sold by the Detroit Trust Co., receiver of the Warren Company, to W. H. Rands, of the Rands Mfg. Co., Detroit, Mich., for $14,600. It was at first intended to sell the property in parcels, but finally the whole plant, equipment and everything else except the quick assets were put up as one lot.

To Double Maxwell Plant—According to a statement made by a representative of the concern, the Maxwell Motor Car Co. is to begin operations at once to enlarge their Highland Park plant to such an extent as to practically double its output. It is estimated that when the additions are completed the company will give employment to approximately 4,000 men. Real estate men in Highland Park say that this proposed enlargement, together with the new million-dollar plant of the Ford company will tend to inflate realty values in the village in a considerable degree. The proposed addition will be built adjoining the present plant of the Maxwell company on Oakland avenue.

Cameron's Factory Plans—The Cameron Motor Car Co., Beverly, Mass., that has been in existence for a number of years here, has decided to abandon the plant and move to West Haven, Conn., where active operations will be started on August 1. The reason given for moving is that Beverly with but one bank is not in a position to look after financial matters when money is necessary to move goods, etc., and so West Haven was picked out. The Cameron company has purchased outright the shop formerly occupied by the Mathushek Piano Co., occupying almost a block on Campbell avenue and Brown street, with about 70,000 square feet of floor space. The Cameron company is incorporated in Massachusetts and plans to raise its capital stock to $250,000, and of this amount $50,000 will be subscribed by West Haven investors. The plant will employ 250 men, and the company will turn out a four-cylinder water-cooled, 30 horsepower car, with self-starter. It is planned to build 1,000 cars for the 1914 season.

Shows, Conventions, Etc.

October 13.....Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
December 9-12.....Philadelphia, Pa., Annual Convention of American Road Builders' Association.

Race Meets, Runs, Hill Climbs, Etc.

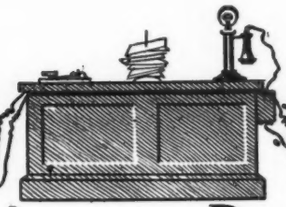
July 8-16.....Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11.....Twin City, Minn., National Reliability Tour, A. A. A.
July 12-13.....Seattle, Wash., Track Races, E. A. Moross.
July 17.....St. Joseph, Mo., Track Meeting, J. A. Sloan.
July 18-19.....Peoria, Ill., Track Meeting, Automobile Club of Peoria.
July 20.....Tulsa, Ariz., Track Races, Tulsa Automobile Club.
July 21-25.....Grand Rapids, Mich., Automobile Club Tour.
July 26.....Orangeburg, N. Y., Track Meeting, Rockland County Fair Assn.
July 26-31.....San Antonio, Tex., Tour, San Antonio Automobile Club.
July 27-28.....Tacoma, Wash., Tacoma Road Races.
July 28-29-30.....Galveston, Tex., Beach Races, Galveston Automobile Club.
July 29-31.....Lincoln, Neb., Reliability Run, Lincoln Automobile Club.
July 31.....Philadelphia, Penn., Truck Parade, *Philadelphia Inquirer.*
August .....Des Moines, Iowa, Reliability Run, Iowa State Automobile Assn.
Aug. 5.....Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 9.....Santa Monica, Cal., Road Race, Santa Monica Road Race Committee.
Aug. 12.....Kansas City, Mo., Reliability Tour, Kansas State Automobile Assn.
Aug. 18-20.....Milwaukee, Wis., Fourth Annual Wisconsin Reliability Tour, under the auspices of the Wisconsin State Automobile Assn.
Aug. 25-30.....Cleveland, O., Midsummer Show, Forest City Fair, Cleveland Automobile Show Co.
Aug. 29-30.....Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6....Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1.....Columbus, O., 200-Mile Track Race, Columbus Automobile Club.
Sept. 8-15.....Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Sept. 9.....Corona, Cal., Track Race, Corona Automobile Assn.
Sept. 12.....Canfield, O., Track Meeting, Canfield Fair Assn.
Sept. 13.....Covington, Ky., Track Meeting, Cincinnati Automobile Club.
Sept. 13.....Grand Rapids, Mich., Track Races, Grand Rapids Automobile Club.
Sept. 20-21.....Detroit, Mich., Track Races, Michigan State Fair.
Nov. 6.....Phoenix, Ariz., Track Meeting, State Fair.
Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign.

July 12.....Amiens, France, Grand Prix Race.
July 13.....Paris, France, French Grand Prix Cyclecar Race.
July 15-30.....London, Eng., Olympia Heavy Motor Vehicle Show.
July 18-26.....London, Eng., Imperial Motor Transport Conference.
Aug. 28-30.....Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
Sept. 21.....Boulogne, France, 3-Litre Race.
Sept. 25.....Isle of Man, International Stock Car Race.
October .....Paris, France, Automobile Show, Grand Palais, 10 days.
November .....London, Eng., Annual Automobile Exhibition, Olympia.

The two factories of the Lenox Motor Car Co., which has headquarters at Boston, Mass. The building at the left is the plant of the company at Jamaica Plain, which is 120 feet long and 40 feet wide, while that at the right is the new plant at Hyde Park. It is 225 feet long and 91 feet wide and is built of cement, incorporating all modern improvements. The structure is designed to give ideal working conditions

The Week in the Industry



Engineer — Dealer — Repairman — Garage

GFORER NAMED ALCO SERVICE MANAGER—J. F. Gforer has been appointed service manager of the American Locomotive Co.'s automobile department, his headquarters being in New York City. In creating this office, the officers of the Alco company are merging the service department for dealers and that for automobile owners, resulting in a general service department and concentrating the work of the company.

CLEVELAND WILL REPAIR STREETS—The Cleveland Board of Efficiency has just appropriated $180,000 for the repair of streets.

LIMA COMPANY'S BIG EXPORTS—The Gramm Bernstein Co., a short time ago, received twenty-two export orders during one week.

GETS NEW FIRE MOTOR—A $9,000 motor-driven fire engine has been delivered by the La France company to the City of Dothan, Alabama.

ALAMEDA ORDERS FIRE CAR—The fire department of the city of Alameda, Cal., has ordered a Paige 36 recently, so as to make it more efficient.

MAKING MISSISSIPPI LOG—A log of all Mississippi roads, which permit of motor car travel, is being prepared by Gen. F. F. Myles, of Brown Wells.

MARIETTA POLICE INFORCES TRAFFIC RULES—The police department of Marietta, O., has been given strict orders to inforce the existing traffic rules and regulations on the streets of that city.

GOODYEAR MAKES CHEAP DEALERS' SIGNS—The Goodyear Tire & Rubber Co., has organized a plan whereby Goodyear dealers can save 82 per cent. on the prices of 100 road signs in their terrtitory.

IN NEW QUARTERS—The Massachusetts State A. A. has opened quarters at 93 Massachusetts avenue, Boston, for the convenience of its members who are in that city seeking information on laws and touring.

NEW TEXAS CLUBHOUSE—Ground was broken July 4 for the clubhouse of the Dallas, Tex., Automobile Club. Automobile owners from all parts of the county were present. The new clubhouse will cost $15,000.

LOGAN ORGANIZING ITS TRAFFIC—The village of Logan, O., has adopted an ordinance providing for a full set of traffic rules and the police department has been ordered to see that the new rules are strictly enforced.

GETTING AFTER LICENSE FEES—By sending inspectors into the rural districts of Alabama the State added several thousand dollars to its tax fund. In several communities no attention had been paid to the law requiring a tag.

ADDITION FOR HUMES AUTO—The Humes Auto Co., of Tarentum, Pa., contemplates the erection of an addition to its building. This part will be used as office and as accessory supply house. The building will be one flight high.

CHILLICOTHE TRACTION LINE ORGANIZED—The opening of an auto bus line between Chillicothe and Bainbridge, O., has been the means of having an electric traction company organized to build a traction line, connecting the two points.

PARADE OF CARS A FEATURE—A parade in which 400 automobiles took part was a feature of the Denver-to-the-Gulf highway convention, held in San Angelo, Tex., last week. Next year's convention will be held at Trinidad, Colo.

CLEVELAND TOWN BUYS FORDS—The Ford Motor Co. has delivered since January 1 twenty automobiles to the city of Cleveland, divided among the following departments: Fire, police, park, board of education, and street railway commissioner.

WEAVER IS CLEVELAND LOZIER MANAGER—A. C. Weaver, formerly manager of the Lozier Sales Co., Cleveland, O., has become general manager. A. W. Woodruff, former sales manager, is now manager of the Lozier branch in Boston.

OWNERS SPEEDING SENTENCED TO FINES—Fifteen automobile owners, of Lead, S. D., have been sentenced for speeding, each of them being $15. This has been done as a consequence of a systematically conducted campaign against automobile speeding.

STEPHENS TO OPEN A GARAGE—G. W. Stephens, formerly with Carl Esterbrook, of Three Rivers, will open a garage in Pawhuska, Okla., on August 1. He also contemplates contracting for the agency of a low-priced and a medium-priced automobile.

LINES WITH RICHARDSON COMPANY—O. M. Lines, formerly sales manager of the Cleveland Cadillac Co., and previously connected with the local Packard forces, has joined the sales organization of the Richardson Motor Car Co., local Cole car distributors.

SPEARE LEAVES REGAL-HAYNES—L. R. Speare, ex-President of the A. A. A., who had a financial interest in the W. L. Russell Co., Boston agents for the Regal and Haynes cars, has sold out his interests to Mr. Russell, who is now conducting the agencies alone.

CLEVELAND ORPHANS GET TREAT—A few days ago, the orphans of Cleveland, 3000 in number, were treated by the members of the local automobile club, to a ride. There were 500 machines used. The little tots were taken on a tour through the city and its parks.

MEXICANS SEEK CARS—Automobiles have been found so useful by the Mexican government in keeping the Federal district free of bandits that it has been decided to enlarge the territory patrolled by the motor squads. In order to get the cars into service quickly advertisements were put in the newspapers for second-hand cars.

CHASE TRUCK MUCH EXPORTED—The Chase Motor Truck Co., of Syracuse, N. Y., claims to be the biggest truck exporter in the country. A short time ago the company received on one day orders from Hongkong, Melbourne, Auckland, Baranquilla (Columbia) and Havana. The Hongkong order came from a missionary and was for a 500-pound wagon.

MOON RECEIVES RECORD HIDE—The largest hide ever imported into this country was received by the Moon Motor Car Co., St. Louis, Mo., last week. This hide contains an area of 87.5 square feet, being 11 feet in its maximum length and 9 feet in its maximum width. The hide was imported from France, where very good material of this sort is produced.

ARMLESS JUDGE TAKES TOUR—Texas' armless motorist, Judge Quentin D. Corley, of Dallas, has completed a 600-mile tour in the state. Judge Corley operated his car every foot of the distance. Judge Corley steers with an eight-inch stub of one arm, which fits into a steel hoop fastened to the steering wheel. Other devices of his own invention give him perfect control of the car.

NEW TENNESSEE HIGHWAY—A new highway, to be second to none in the state, has been decided upon to connect Nashville and Chattanooga, Tenn. On July 4 more than 100 representative motorists from the two towns met at Athens, the half-way point, and made final arrangements for raising the sum, which must be added to the county and state funds to secure the high grade of road desired.

NEW LOZIER DEALERS, PHILADELPHIA, PA.—The General Motor Co., distributer of the Lozier, has been superseded by J. W. Bigelow and Guy Willey, under the firm name of the Bigelow-Willey Motor Co. The latter company has taken over the General Motor Co.'s new establishment at Twenty-first and Market streets and in addition to the Lozier will also handle the Federal and Standard trucks in this city and adjacent territory.

NEW TEXAS LAW IN EFFECT—Texas' new automobile law went into effect July 1. The minimum penalty for stealing a motor car now is 6 months' imprisonment. Driving a car without the permission of the owner is to be interpreted as an attempt to steal. Severe penalties are provided for starting the motor or shifting any part of the mechanism of a car without permission. Wilful scratching or damaging a car is also provided for in the new statute.

MERIDIAN TO BUILD ROAD—Meridian, Miss., has given a written promise to the chief highway engineer of Alabama, to build a chert road between Meridian and the Alabama line as soon as the main highway from central Alabama is completed to the border. Meridian already is the center of a system of 70 miles of highly improved roads. The roads are surfaced with chert, over which a layer of oil, containing seventy per cent asphalt, has been laid.

TO TAKE OVER GARAGE—The Stocum-Bronson Automobile Co. has been organized at Oshkosh, Wis., to take over the garage of Philip W. Stocum, 43-45 Ceape street. The principal owners of the company are Mr. Stocum and Leslie K. Bronson, who has for four years been secretary and general manager of the Oshkosh Chamber of Commerce and is a well-known newspaperman. The Stocum-Bronson garage will be enlarged and much new equipment added.

GOOD ROADS FOR GUATEMALA—In order to hasten the construction of automobile roads in the San Carlos district, the Guatamelan government has agreed to put up dollar for dollar with the German coffee planters of that region for the construction of roads. The work is to be done under the supervision of an engineer appointed by each of the contributors. One of the first roads to be improved is between Ayutla and Caballo Blanco. A road to the port of Ocas probably will be improved next.

OLD RAMBLER MEN MEET—Forty-eight employes of the Thomas B. Jeffery Co., Kenosha, Wis., who have been with the company and its predecessors all the way from 29 to 12 years, were guests of honor at a banquet tendered to Matt Matson, superintendent of the pattern department, who recently resigned to engage in pattern-making at Racine. Mr. Matson served the Jefferys for more than 25 years. As the result of the banquet, an organization to be known as the "Old Timers" will be formed to annually honor the employees of longest service.

CONNECTICUT LICENSES GREATLY INCREASE—The new state register has been issued by the secretary of state's office. It contains the new motor vehicle law, revised list of automobiles, rate of taxation and list of various makes of cars and the taxable horsepower of each. The book shows that there are 17,945 pleasure cars licensed in the state. Twelve manufacturers' and 398 dealers' cars are registered. State Highway Commissioner Bennett, who recently succeeded James H. MacDonald, has laid down a few rules for contractors that will result if followed in much better conditions for the motoring public.

FOR INDIANA'S BIGGEST GARAGE—William H. Lee, owner of Ye Auto Inn, 20 West Thirtieth street, Indianapolis, has let contracts for an addition, which, when completed, will make the garage the largest in Indiana. The addition will be 80 by 60 feet, making the total size of the garage 60 by 200 feet and giving a capacity for one hundred cars. The addition will be two stories high. The second floor will contain three living apartments, one of eight rooms and a bath and two of five rooms and a bath each. The garage is built of concrete blocks, with a composition roof, making the garage practically fireproof.

INDIANA LICENSE TAGS DELAYED—Although the manufacturers say that the new Indiana license tags have been shipped they have not reached the state secretary's office so far. The motorists will this year have to pay licenses for a period of only 6 months. The annual fees follow: Dealers and manufacturers license, $25; professional chauffeurs, $2; motorcycles, $2; motorcars, 25 horse power or less, $5; from 25 horse power to 40 horse power, $8; from 40 to 50 horse power, $15; over 50 horse power, $20; all electric pleasure vehicles, $3; all electric or gasoline commercial cars, $5. The horse power is to be based on the S. A. E. rating.

CHALMERS TO FEATURE CONVENTION—Hugh Chalmers, president and general manager of the Chalmers Motor Co., Detroit, Mich., will be the principal lay speaker at the thirty-seventh annual convention of the Association of Agents of the Northwestern Mutual Life Insurance Co., of Milwaukee, the second largest mutual life concern in the world, which will be held here on July 14, 15 and 16. Mr. Chalmers is considered the highest . industrial official in the United States and his address, the subject of which has not yet been announced, will undoubtedly deal with the success and progress of the motor car industry, with particular reference to the captains of industry developed by the industry.

OPENS WILLIAMANTIC BRANCH—The Hood Rubber Co., Watertown, Mass., has opened a branch at Willimantic, Conn.

RETIRE FROM BUSINESS—Skinner Bros., who have represented the Chalmers, Stearns and Woods electric in Hartford, Conn., have retired from business.

GARAGE FIRE COST $1,200—L. W. Parker, owner of a garage at Weston, O., suffered a $1,200 loss in the $15,000 fire which swept the little city some time ago. Practically the entire village turned out to fight the fire.

FORM BUFFALO TAXI UNION—Taxicab drivers in Buffalo, N. Y., want contracts for a uniform scael of $18 a week, a 12-hour day and two days off each month. At present they work 7 days a week. It is said that there are 250 men in a union that the chauffeurs have formed.

TO PREACH FROM TONNEAUS—The ministers of Lima, O., are planning a unique religious campaign for the summer. Automobiles will be brought into requisition as pulpits and services will take place in public parks and on street corners, sermons being delivered from the rear of the motor cars.

NEW ORLEANS SHELL ROAD—New Orleans, La., motorists have another shell road on which to divert themselves. A 50-mile highway to Pointe-a-la-Hatche has been thrown open to traffic. The road is through a highly-developed agricultural country and is certain to be one of the most popular drives out of the Crescent City.

CONNECTICUT BRIDGES WEAK—In the town of Berlin, Conn., a loaded truck fell through the bridge and dropped into the water underneath. The car was damaged more or less. This incident calls to mind that numerous bridges within the state of Connecticut are hardly strong enough to withstand heavy traffic and should be rebuilt or strengthened.

COLE HAS THEFT BUREAU—The Cole Motor Car Co., Indianapolis, Ind., has established a department to assist in the recovery of stolen Cole automobiles. J. D. Riker has been appointed head of the department. As soon as a car is reported stolen the new department notifies the Cole representative, who scours the country for the missing machine. The new department has recovered two automobiles since it has been in operation.

AFTER BRIGHT HEADLIGHTS—Brilliant headlights have attracted the attention of members of the Hartford, Conn., city government. A measure was introduced in the common council providing for a fine of $20 for the use of brilliant lights. The matter was laid on the table for future consideration. There has been much comment of late regarding the bright lights used about the city. These are considered unnecessary on brightly lighted streets.

NEW TOLEDO QUARTERS—H. E. Throne, Mitchell and Paige distributor, is now located in the new location at Madison avenue and Fifteenth street, Toledo, O., for which a lease was recently closed. This structure is in the new part of "motor row" and is one of the most modern salesrooms in Toledo. This building was built specially for the automobile business and has spacious salesrooms fronting on Madison avenue and a splendidly equipped garage and service station on Fifteenth street.

MUST OBSERVE SPEED LIMIT—The sheriff of Milwaukee county, Wis., has announced that all motorists must observe the county speed limit of 25 miles an hour hereafter. Due to foolish driving by irresponsible motorists and cyclists, the sheriff says he can no longer tolerate higher speeds. It has been customary to give drivers a leeway of 5 miles an hour, and not one was halted who drove below 30 miles an hour. Four additional mounted deputies have been placed on daily duty, making ten who are now watching for speeders.

GAUNTLETT FIRM'S NEW HOME—The Gauntlett Auto Sales Co., Toledo, O., Buick distributors in Northwestern Ohio and Southern Michigan, has moved into the three-story structure at 1014-1016 Madison avenue, formerly occupied by the Packard agent. This concern, headed by E. D. Gauntlett, came to Toledo at the time of the spring auto show and took space with the Rambler agency as a suitable location could not then be secured. Since Mr. Gauntlett took over the Buick agency he has been granted several increases in territory.

ORGANIZE ENGINEERS CLUB—A Milwaukee, Wis., section of the American Society of Mechanical Engineers has been organized with Fred H. Dorner, chief engineer of the Power Improvement Co., as chairman. Arthur Simon, electrical engineer of the Cutler-Hammer Mfg. Co., is a member of the temporary executive committee. Permanent organization will be effected late in July. All Milwaukee members of the Society of Automobile Engineers are members of the new section, the organization of which has revived interest in the plan to organize a local section of the S. A. E. Oscar Stegeman, of the Stegeman Motor Car Co., is one of the chief promoters of the latter plan.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BOWLING GREEN, O.—Modern Motor Car Co.; capital, $1,000; to manufacture and deal in automobiles, motor trucks, etc. Incorporators: W. P. Albey, Dale I. Ladd, R. E. Ladd, J. A. Walker, T. E. Moore.

CHICAGO, ILL.—Pneumatic Gear Shift Co.; capital, $25,000. Incorporators: Geo. W. Killelea, E. O. Leowen, D. Krinsky.

CLEVELAND, O.—Overland-Garford Sales Co.; capital, $10,000; to manufacture and deal in automobiles. Incorporators: Malcolm Bridgman, Royal R. Scott, Geo. F. Russell, Herbert O. Fitch, Chas. M. Ackerman.

COLUMBUS, O.—Columbus Electric Vehicle Co.; capital, $50,000; to manufacture and deal in automobiles, trucks, etc. Incorporators: O. H. Perry, D. N. Perry, W. G. Neff, C. E. Firestone, T. R. Sellers.

DAYTON, O.—Dayton-Buick Co.; capital, $10,000; to deal in automobiles, trucks, etc. Incorporators: L. J. Haughey, Chas. Abel, Joseph A. McKenny, Earl Simon, A. J. Smith.

INDIANAPOLIS, IND.—Auto Drive & Parts Co.; capital, $100,000; to manufacture automobile drives and differentials. Incorporators: John J. Kennedy, John J. Kelly, L. D. Buenting.

NEWARK, N. J.—Auto Maintenance Co.; capital, $10,000; to do a general automobile business. Incorporators: Bernard A. Kelly, Catherine Kelly, John E. Anderson.

NEW YORK CITY—Standard Purchasing Co., Inc.; capital, $10,000; to do a general automobile business. Incorporators: Harry L. Cook, Harry F. Dexter, William H. Brooks.

WILMINGTON, DEL.—Lamb Engine Co.; capital, $50,000. Incorporator: William J. Maloney.

WILMINGTON, DEL.—Maxwell Motor Sales Corp.; capital, $10,000. Incorporators: Robert H. Bagnall, A. Spotswood Campbell, William J. Maloney.

GARAGES AND ACCESSORIES

BREMEN, O.—Bremen Garage Co.; capital, $10,000; to operate a garage and do general repair work. Incorporators: Albert E. Godfreyn, Edward A. Hufford, Arthur D. Hufford, Howard D. McCandlish, Milton L. Campfield.

CLEVELAND, O.—Auto Garage Co.; capital, $10,000. Incorporator: H. E. Bernstein.

COLUMBUS, O.—Uhrlandt Gas Generator Mfg. Co.; capital, $100,000; to manufacture and deal in gas machinery, generators, carbureters, etc. Incorporators: Daniel N. Hyman, Oswell C. Phillips, Harry D. Shepard, Arthur Uhrlandt, Samuel Esswein.

DALLAS, TEX.—Dallas Automobile Club Association; capital, $5,000; to maintain an automobile club. Incorporators: S. H. Breen, A. V. Lane, P. H. Keene.

GEORGETOWN, DEL.—Georgetown Garage & Supply Co.; capital, $10,000; to operate a garage.

BEAUMONT, TEX.—Orleans Motor Co.; capital, $7,500. Incorporators: C. L. Smith, J. K. Smith, S. F. McConnico.

FORT WAYNE, IND.—Eagle Mfg. Co.; capital $50,000; to deal in auto plows and machinery. Incorporators: H. F. Schnelker, W. J. Barth, Frederick Krejbaum, F. Green, Chas. B. Orff.

INDIANAPOLIS, IND.—Merchants Garage; capital, $15,000; to do a general garage business. Incorporators: C. S. Shotwell, M. J. McGarr, H. H. Rice, W. A. Atkins, B. D. Christian, C. W. Dicks, C. B. Marshall.

LOUISVILLE, KY.—W. P. Smith Auto Repair Co.; capital, $10,000. Incorporators: W. P. Smith, W. R. Schmidt, G. R. Schmidt, Phil A. Deck.

NEW YORK CITY—G. B. Sales Corp.; capital, $5,000; to deal in automobile accessories. Incorporators: Edward E. Reardeon, Francis J. O'Grady, Irving V. W. Williams.

PHILADELPHIA, PA.—Pennsylvania Omnibus Co.; capital, $300,000; to manufacture and operate motor cars and establish a taxicab service.

PITTSBURG, PA.—Leisure Auto Safety Dish Co.; capital, $150,000; to purchase and deal in automobiles and trucks.

PORTLAND, ME.—South Bend Spring Wheel Co.; capital, $500,000; to manufacture, sell and deal in wheels and spring wheels of all kinds. Incorporators: A. F. Jones, T. L. Croteau.

RACINE, WIS.—Webster Electric Co.; capital, $60,000.

SAN JOSE, CAL.—Consolidated Garage Co.; capital, $100,000; to operate garage and machinery shops. Incorporator: L. W. Bush.

YOUNGSTOWN, O.—Huffman Mfg. Co.; capital, $10,000; to manufacture and deal in non-skid tire protectors for motor trucks. Incorporators: E. S. Walton, W. B. Hall, H. H. Stambaugh, Richard Garlick, John T. Harrington.

WILMINGTON, DEL.—Easy Starter & Speeder Co. of America; capital, $50,000; to manufacture, sell and deal in and with automobiles and supplies for same. Incorporators: Herbert E. Latter, W. J. Maloney, Oscar J. Reichard.

New Agencies Established During the Week

PASSENGER CARS

Place	Car	Agent
Baltimore, Md.	Chandler	Chandler Motor Car Co. of Baltimore
Binghamton, N. Y.	Empire	W. J. Stephenson
Binghamton, N. Y.	Imperial	W. J. Stephenson
Burlington, Ia.	Chandler	American Motor Sales Co.
Cincinnati, O.	Chandler	Chandler Sales Co.
Cleveland, O.	Pathfinder	Auto Sales Co.
Denver, Colo.	Chandler	Overland Automobile Co.
Eagle Pass, Tex.	Chandler	Jos. De Bona
Fall River, Mass.	Chandler	R. W. Tierney
Gardiner, Me.	Chandler	Guy W. Lawrence
Greenwich, Conn.	Chandler	W. W. Kemble
Hartford, Conn.	Franklin	Universal Auto Co.
Jersey City, N. J.	Chandler	Burke Bros. Co.
Kingston, N. Y.	Chandler	Van's Garage
Lorain, O.	Chandler	A. V. Hageman
Manchester, N. H.	Chandler	Smith & Johnson
Minneapolis, Minn.	Wahl	Stimson Automobile Co.
Morristown, N. J.	Chandler	Spencer, Wilkie Motor Co.
Muscatine, Ia.	Chandler	Bankers Auto Co.
Newburgh, N. Y.	Chandler	Van Motor Co.
Norwalk, Conn.	Chandler	F. E. Lockwood & Co.
Paterson, N. J.	Chandler	Nathaniel Fink
Pottstown, Pa.	Chandler	Wm. P. Young
Red Bank, N. J.	Chandler	Stryker & Stryker
Sharon, Pa.	Chandler	W. C. De Forrest & Son
So. Bend, Ind.	Chandler	Nat. L. Otis
Sommerville, N. J.	Chandler	J. C. Henry
Stamford, Conn.	Chandler	Wm. A. Clark
Stapleton, N. Y.	Chandler	E. Neumann & Sons
Westfield, N. J.	Chandler	H. L. Fink
Youngstown, O.	Chandler	J. Ralph Seidner

COMMERCIAL VEHICLES

Place	Car	Agent
Fremont, O.	Chase	Miller Bros. Co.
Minneapolis, Minn.	Menominee	L. J. Hadley

M & M PNEUMATIC CASING—Fig. 1 illustrates the M & M tire casing, made by the M & M Tire Co., Trenton, N. J. This tire, the manufacture of which was taken up some time ago, has now been perfected and the company is continually increasing its facilities and will soon enter its new factory. The tire differs from the ordinary casing by the peculiar shape of the inner surface, the angle shown in the cross section being formed in all the layers of the fabric. A re-inforcing layer which runs approximately parallel with the tread surface is in place on top of these layers, and a stratum of pure rubber is imposed on this layer, the tread being laid on this rubber. The inner tube, if fully inflated, will conform to the shape of the casing which affords increased protection against nails, stones and other objects which ordinarily cause punctures. It is said, also, that the increased thickness of the casing in that portion which lies directly under and above the running belt of the tread permits of using the tire for a longer time and wearing it down to a greater degree than if the thickening were not used; the maker claims that, although the guarantee for each M & M tire is for 6,000 miles only, the first tire made has run for 16,000 miles and is still in service.

Jones Pneumatic Suspension—A novel system of producing the effect of pneumatic tires without the use of such on the wheels, their place being taken by solid tires, has been evolved by Lyman D. Jones, Bridgeport, Conn. Fig. 2 shows this device, which consists of a special axle clip C taking the place of the standard one fitted to the car originally. If the latter is replaced by the special clip, the axle is connected to it as ordinarily, and the body is supported, not only by the spring equipment, but also by a section of a pneumatic tire tube and casing T, which rests on a plate suspended from the axle clip. A frame which engages the tire through a clincher device is attached to the car spring. Thereby, the effect of the latter is assisted by that of the pneumatic equipment. Besides, there are for each wheel two air plungers between the tire section and the frame supporting it, which still further enhance the effect of the tire sections.

Sanford Portable Fuel Tank—A wheeled gasoline tank of steel, Fig. 3, is made by the F. C. Sanford Mfg. Co., Bridgeport, Conn. This has a capacity of 50 gallons and is equipped with a self-measuring pump operated by a crank. The wheels are shod with cushion rubber tires and carried in roller bearings. A two-way nozzle and 8 feet of hose are attached to the pump, which is fitted with a key-locking device and a float indicator showing at all times the contents of the tank in gallons. The pump cylinder and the valves are of brass, while all other parts are made of steel. A wheel brake is fitted to the wheels.

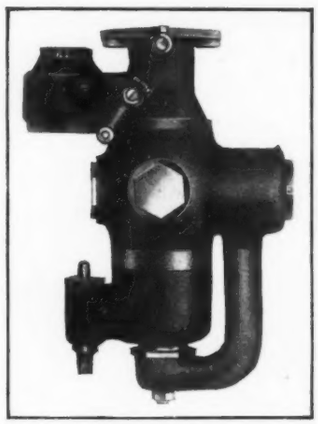


Fig. 4—Harroun kerosene carbureter

Harroun Vertical Kerosene Carbureter—The Ray Harroun Co., Indianapolis, Ind., is now marketing its kerosene carbureter designed by the former racing driver, Ray Harroun. A test made with this device was described in THE AUTOMOBILE for April 26. The carbureter Fig. 4, consists of a housing or shell equipped with an intake F for the kerosene, which latter flows thence to a nozzle in a choke tube, the nozzle being of special design. The regulation of the flow of fuel is by a float-chamber device contained in the lower portion of the housing. The heat of the exhaust is used to heat the fuel after the same has been partially mixed and atomized by the nozzle. Primary air enters through A, and auxiliary air through A1. The latter valve device is linked to the fuel nozzle, which is closed automatically through the movement of the auxiliary air device. The only control mechanism is operated from the dash. The auxiliary air is cold when admixed to the primary mixture.

Michigan Auto-Joint Co., Roller Bearing Universal Joint—In common with the other parts of the motor car, the universal joints are coming in for their share of consideration by inventors with the view of devising better constructions, reducing friction and improving upon any other weak features which they may have.

The universal joint must allow for a certain amount of end slip in the propeller shaft due to its differences of angularity on account of the various vertical positions of the rear axle with respect to the frame of the car. To take care of this slip, the end of the shaft is usually squared and works back and forth in a squared hole in the arm of the joint. On heavy cars, this has sometimes proven unsatisfactory, due to the large torsional strain.

To eliminate this weak feature and to reduce friction to the minimum, the Michigan Auto-Joint Co., Grand Rapids, Mich., comes forward with a type of universal joint which utilizes roller bearings and is said to eliminate all of the shaft end twisting strain by placing the slip inside of the joint itself and on the roller bearings.

Fig. 5 is a phantom view of the assembled joint showing how the roller bearings are mounted. Fig. 6 gives an idea of the two center blocks, which are identical though working at right angles so that universal action may be obtained. These center blocks C are seen to be so assembled that they have no motion relative to each other except a slip motion which tends to pull them apart. In other words, they amount to the same thing as the cross or spider of the conventional joint so far as rotation is concerned.

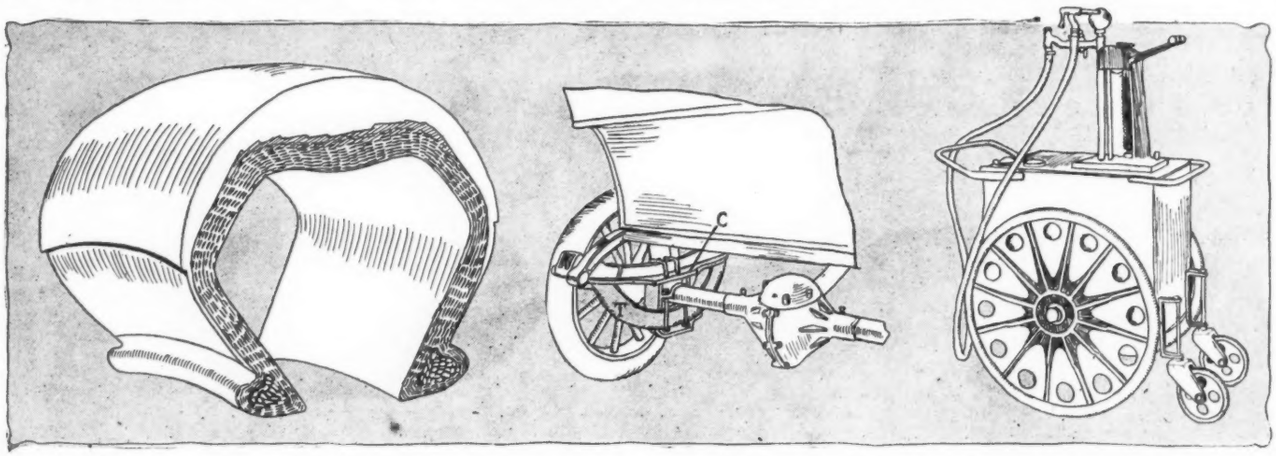
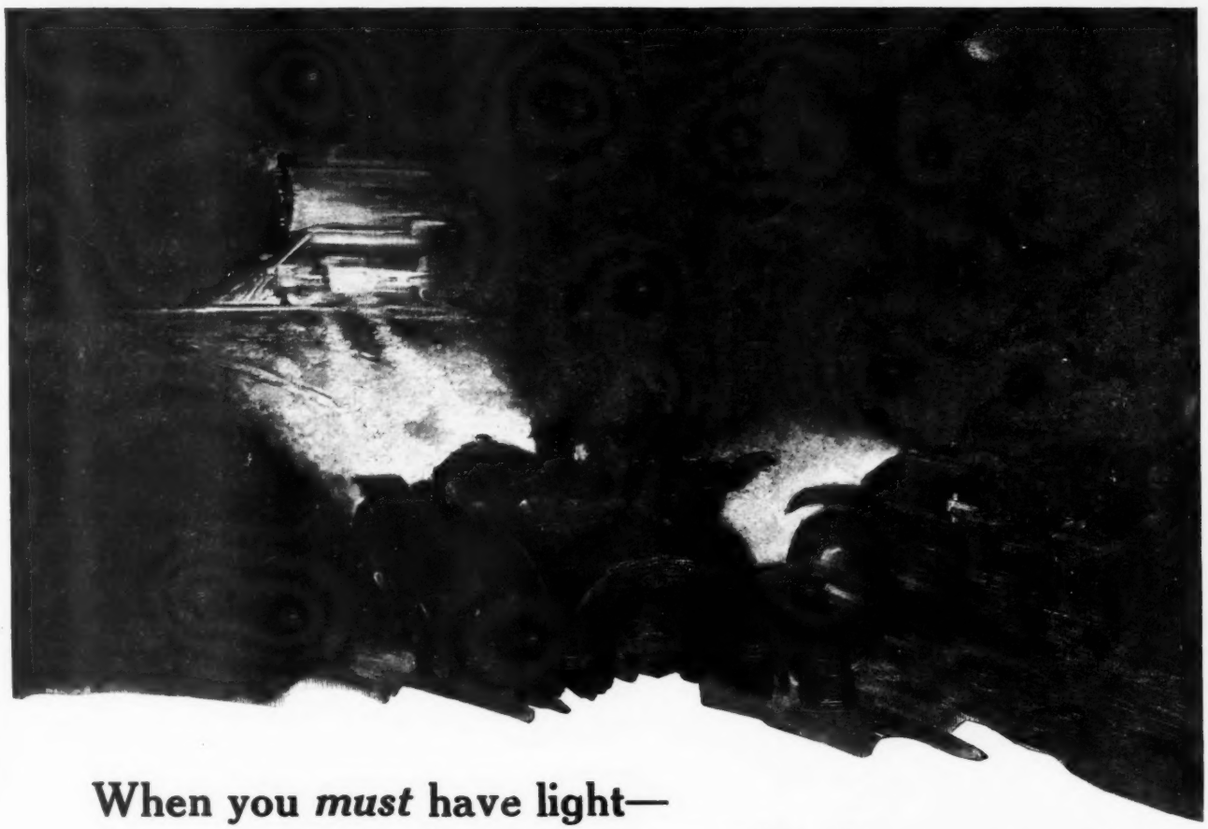


Fig. 1—M & M pneumatic tire. Fig. 2—Jones pneumatic automobile suspension. Fig. 3—Sanford wheeled gasoline tank



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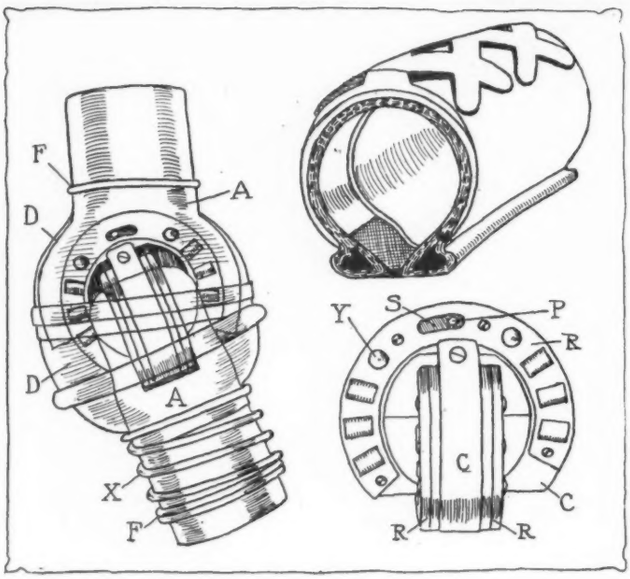

Fig. 5—Phantom view of the roller bearing universal joint made by the Michigan Auto-Joint Co. Fig. 6—The two center blocks. Fig. 7—New non-skid casing made by the Mohawk Rubber Co.

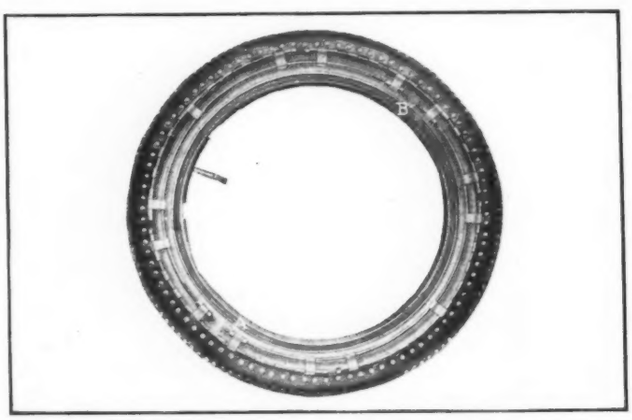

Fig. 8—Tire protector manufactured by the XXX Auto Accessory Co. This protector is of canvas and asbestos and is designed not to heat up

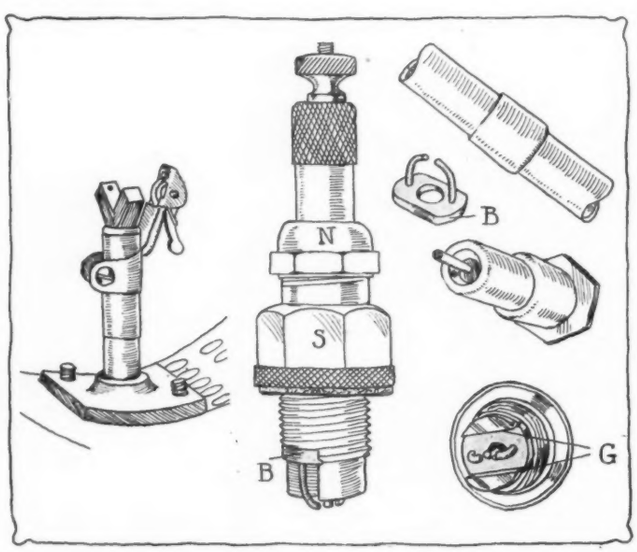

Fig. 9—Morgan friction igniter for acetylene headlights. Fig. 10—XXX company's interchangeable-point spark plug

But instead of the plain bearings on the ends of the ordinary universal cross on which the forked ends of the shaft partially rotate in order to give universal rotary motion, this motion is obtained in the Michigan Auto-Joint by the oscillation of the arms A, Fig. 5, on the roller bearings, which are in turn free to oscillate through a certain angle with respect to the center blocks.

As shown, the roller bearing retainers R are partial circles, and their rotative motion is limited by the length of the slots S, which surround the pins P attached to the center blocks. The rolls in the retainers are made 1/32 inch short to allow for end play and necessary slip to allow them to operate. On each side of the retaining slot a ball bearing Y is placed, this being used since at this point a roller would be forced to slide endways, due to the angle.

There are only two set screws in the entire construction, these being used to hold the two center blocks in place. After these screws have been removed, it is a simple matter to pull the joint apart. To dismount further, the center block may be turned about one-quarter around after which it will come out of the arm easily. A split cap D encloses the mechanism, being held in position by flat wire springs F let into the arms. At one end there is a coil spring X which acts directly against the movable part of the cap, taking up the internal slip and permitting of oiling.

Mohawk Non-Skid Rubber Tread—The Mohawk Rubber Co., Akron, O., manufactures the non-skid casing shown in Fig. 7. This is built up in a rather conventional manner, consisting of a six-layer fabric ring, on which a layer of rubber and a breaker strip are superimposed in turn, the tread of well-cured rubber being carried directly on the breaker strip. This tread consists of a slanting covering for the strip which is thickest in the middle and thinnest at both sides. The non-skid effect is produced by a double row of Xes worked in relief on the tread surface and touching each other with the bases of the Xes at the equatorial line of the tread, where, thereby, diamond-shaped cups or depressions are formed. These diamonds are compressed when traveling on the ground and tend to hold it, so that side skid is made very difficult. The company also makes an inner tube, the inner ring portion of which is reinforced with a fabric lining so shaped as to fit between the inside of the bead sections.

XXX Heatless Tire Protector—The XXX Auto Accessory Co., Springfield, Mass., makes a tire protector, Fig. 8, of canvas and asbestos which does not heat up. To prevent skidding the cover is fitted with steel studs along that section which forms the running tread. The method of tightening this protector on the tire and of preventing its creeping thereon is specially original. There are a number of small tube sections attached to the periphery of the cover on both sides of the protector, and on each side they slide on circular rods. Besides these, there are on one side two semicircular rods connected to the other rods by links secured to both, and by tightening the nuts A and B on the two ends of one rod, the protector is drawn tight on the tread.

Morgan Acetylene Lighter—B. Morgan, Newport, R. I., is the maker of the friction igniter for acetylene lighting outfits, Fig. 9. This device consists of a lever which if lifted compresses a spring. If the lever is released, the spring snaps back and with a specially-prepared piece of steel comes into frictional contact with a rough surface finished in the style of a file, thereby producing a shower of sparks and igniting the acetylene which must be turned on before lifting and releading the lever. The device is secured to the acetylene burner by means of a metal U, the ends of which are held tightly together through a screw.

XXX Interchangeable-Point Plug—The XXX Auto Accessory Co., Springfield, Mass., manufactures the spark-plug, Fig. 10, which is characterized by the use of an interchangeable sparking point and by the fine workmanship used throughout it. This plug is of the porcelain-insulation type, the porcelain being made with a double shoulder, the lower bearing against the bore of the shell S and the upper against the binding nut N. The shell is threaded on its two ends, the lower thread fitting into the cylinder and the upper into the binding nut, and if both threads are tight in their respective female threads, leakage is made impossible by virtue of the double shoulder of the porcelain. The positive electrode inclosed in the porcelain is so formed as to fit tightly against this substance and it is formed with a flat end. The negative electrode is formed by a copper bridge B into which the two sparking points are set and which may be slipped into a gap G cut in the lower end of the threaded shell. This construction has the obvious advantage that if the points are carbonized or covered with oil in the plug, the simple remedy is to unscrew it, force the copper bridge B out of the shell gap G and replace it by a reserve bridge B1.